TRANSACTIONS

OF THE

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

JULY 1863—MARCH 1865.

NEW SERIES.

WILLIAM BLACKWOOD AND SONS, EDINBURGH;
AND 37 PATERNOSTER ROW, LONDON.
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CONTENTS.

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PRELIMINARY NOTICE.

In conformity with long-established practice, it is the duty of the Directors to prefix to this, the first number of a new volume of the Transactions, a short notice, explanatory of the present position of the Society, and of its proceedings since the commencement of the last volume in 1861. During that period the Society has continued to receive the same liberal support, which has been accorded to it for the greater part of a century, in numerous additions to its members, and zealous co-operation in all that concerns its General Shows, its District Competitions, and other undertakings.

The number of members now on the roll is 3910, and a large addition is anticipated at the ensuing election before the Kelso meeting.

By the statement of accounts submitted to the General Meeting in January, the funds stood as follows:—

Funds permanently invested, ...	£38,121	11	5
Balance in Bank, ...	1,382	7	3
Value of house property, ...	7,487	18	5

The annual subscriptions by members amounted last year to £867, 18s. 6d., and the life compositions to £718, 4s.

It has been the aim of the Directors to apply the revenue of the Society, arising from interest on investments and members' subscriptions, in the manner most calculated to forward the objects and promote the usefulness of the Institution. It is unnecessary here to recapitulate the different classes of premiums which have been offered for competition, as they have already been printed in the 'Transactions,' and otherwise promulgated. The system under which they are regulated has been so gradually, and over so long a

period, moulded by circumstances, that it would be difficult with advantage suddenly to introduce any material innovation, but effect is always given to such additions and modifications as tend to stimulate the progress of agricultural improvement, and to widen the sphere of the Society's operations.

General Shows.—The annual meeting for 1861 was held at Perth, with results satisfactory to the district and to the Directors. As compared with former Shows, the quality of the stock exhibited a marked progress, and the collection of implements a vast increase in number and variety. The Directors have to acknowledge the liberal manner in which the counties connected with the meeting assessed themselves for the purposes of the Show; and they are glad to be able to report that the deficit against the Society did not exceed £100—a smaller sum than can now be generally anticipated, looking to the augmented expenditure consequent on the prolonged duration of the meetings, and the necessity of providing sheds for stock and implements.

The meeting for 1862 was originally fixed for Kelso; but a desire having been expressed by that district, as well as by the members of the Society generally, that Scotland should contribute its quota to the International Show at Battersea, the Kelso meeting was deferred till August 1863, and the Directors exerted the influence of the Society to secure a successful Scottish exhibition in London. In this object they were warmly supported by the Dukes of Hamilton, Buccleuch, Athole, and Montrose; by the late Marquess of Breadalbane, the Earl of Southesk, Lord Kinnaird, Mr Malcolm of Poltalloch, Mr Stirling of Keir, Mr Pollok of Faside, Mr M'Combie, and other well-known exhibitors, through whose exertions a most creditable representation of the native breeds of Scotland was obtained. The Clydesdale horses, it may be observed, commanded special admiration, and, irrespective of the opportunity afforded to Scottish farmers of seeing at Battersea animals from all parts of Europe, the Directors are satisfied that the Society's connection with the meeting there was not only worthy of its position, but is calculated to extend the demand for various classes of Scottish stock. By an arrangement with the exhibitors the Society undertook the exclusive charge of their servants, providing them with lodgings, and sending them in detachments to the Exhibition, the Crystal Palace, and other places of interest; the only return asked at the hand of their masters being, that the men should be respectably attired in national material, and be subject to the regulations laid down by the Secretary. About 120 were accommodated in large marquees hired in London, pitched in an enclosure attached to the show-yard, and furnished with new beds and bedding, issued from the Tower through the kindness of Earl de Grey. The sum which this arrangement may have cost the Society was, it is conceived, well spent, considering the comfort it conferred on the men, and the wholesome control which it was the

means of commanding. Assuredly it was not unworthily bestowed, for the conduct of the servants was unexceptionably creditable; and, as officially reported by the Royal Agricultural Society of England, "a more respectable-looking and well-behaved body of men were never brought together."

The arrangements for the Show at Kelso, which takes place during the first week of August, are nearly matured. In one important department—that of implements—a material change will be introduced. For many years separate premiums have been offered for every description of agricultural implement or machine; but the Directors were advised that, even under the best arrangements, and with the most competent judges, it was in some instances nearly impossible to institute such trials as commanded the confidence of the exhibitors or the public, or furnished a complete test of the comparative merits of the articles in competition. The period of the year was unsuitable, and the time at the command of the judges inadequate, and a miscellaneous trial necessarily embraced many articles of which the character had been already established. Before proceeding to consider the expediency and extent of any change, the opinion of the principal exhibitors, both in England and Scotland, was sought, and a vast majority of them expressed a desire that the whole system of competition and awards should be abolished, and an assurance that such an alteration would add to the extent and enhance the value of the Implement Shows. The Directors, however, considered that the Society could not, in the discharge of its public duty, altogether abandon premiums, and that these in some form must be adhered to, as the means of enabling the Society to pronounce an opinion, and of assisting a meritorious but perhaps obscure mechanist to introduce his invention, and to obtain an investigation and recognition of its merits. Keeping this principle in view, and at the same time desirous of meeting the wishes of implement-makers, the Society, at its last general meeting, resolved that the general list of premiums for implements should be discontinued; that no trials should take place during the currency of the Kelso Show; but that articles, supposed by their exhibitors to embrace a new invention or a radical improvement, shall be entered and described as such in the catalogue, and carefully inspected by a committee, who shall decide which of them should be set aside for trial. An implement so selected will be subjected to a thorough practical test, at the season of the year proper for its operation, on a suitable farm and under suitable conditions—it being in the power of the Directors afterwards to award such a premium as the judges employed may recommend. A decision thus arrived at will command greater respect, and convey more information, than one based on the somewhat imperfect trials instituted during the progress of a Show, and in the month of August.

The discontinuance of direct premiums and of competition in each class supersedes the necessity of separating articles for the purpose of arranging them according to their respective sections in the prize-sheet, and an exhibitor can now show the whole of his goods in one collection. One other change will be initiated at Kelso. Shedding, which hitherto has been confined to stock, it is to be extended to implements, in so far as may be desired by exhibitors, who are entitled either to have their goods placed under sheds on payment of a moderate price, or to have them, as formerly, uncovered; and one portion of the implement-yard will be reserved for the covered and another for the open exhibition. It must be observed that, even with a rate levied on exhibitors, the expense of shedding will greatly add to the cost of the yard, and must swell the margin of that deficit which the accounts of a Show may in future be expected to present.

In consequence of a memorial signed by more than 700 persons connected with Stirlingshire and its neighbourhood, and backed by liberal subscriptions, the Society has resolved to hold its meeting for 1864 at Stirling. This arrangement constitutes a new district, and makes the rotation of the Shows cover eight years instead of seven; it also involves a re-distribution of the Glasgow district, by the severance from it of Stirlingshire and Dumbartonshire. The change, however, meets with the unanimous support of those locally interested; and the Glasgow district, comprising the counties of Lanark, Ayr, Renfrew, Argyle, and Bute, still remains the largest in the country.

An application from the northern counties, inviting the Society to visit Inverness in 1865, was submitted to the last general meeting, and will be disposed of in June. Such an arrangement would work well, by interposing a meeting at Inverness between that at Stirling and the one which will be due at Glasgow in 1866.

LOCAL COMPETITIONS.—With the increased means which the growing prosperity of the Society has placed at their command, the Directors have been enabled from time to time to extend the sphere of the district competitions. These may be said to form the distinction between this Society and the sister institutions of England and Ireland, and the Directors regard it as one which should be carefully cherished and maintained. The mere amount of financial assistance which the Society can afford to bestow on local associations is but a secondary consideration, the great object served by the system being the connection it establishes betwixt the central and the affiliated bodies, and opportunities which it confers on the former of directing the efforts of the latter into proper channels, and of engrafting its own regulations and practice on theirs. This by degrees has gone far to produce a healthy unity of agricultural action and system over the whole of Scotland, and to maintain in every district a machinery which can be at once set in

motion by the Society for the furtherance of any desirable object. During the last year the Society's operations, by means of pecuniary or honorary awards, extended in various departments to not fewer than 290 districts.

THE CHEMICAL DEPARTMENT continues to be conducted by Dr Anderson to the entire satisfaction of the Directors. During the past year many investigations of importance have been carried out in the laboratory, and published in the 'Transactions,' or reported in addresses delivered by the Professor. In the belief that members are not generally aware of the privileges which the Chemical Department affords, the Directors think it desirable to append the table of fees regulated between the Society and Dr Anderson, and containing rates considerably lower than those charged to the public by him and chemists of similar eminence. Not only does a member of the Society requiring an analysis thus command a direct benefit, but Dr Anderson's rates necessarily tend to reduce and equalise the charges for analyses by other professional men.

TABLE OF FEES.

1. Complete Analysis of a Soil, including determination of Alkalies and Phosphates, £3.
2. A partial Analysis of a Soil, such as the determination of the quantity of Organic Matter, and relative proportion of Clay, Sand, and Carbonate of Lime it contains, 10s.
3. Quantitative determination of any one ingredient of a Soil, 7s. 6d.
4. Complete Analysis of Saline Manures and other substances, such as Gypsum, Nitrates of Soda and Potash, and Ammoniacal Salts, Guano, Oilcake, Bone-dust, Rape-dust, Superphosphate of Lime, £1.
5. Testing the above substances for adulterations,—for each Sample, 5s.—This examination is generally sufficient to determine whether or not any of these substances are grossly adulterated, but it gives no idea of the comparative value of different Samples where all are genuine.
6. Determination of the percentage of Phosphates and Ammonia in a Guano, 10s.
7. Determining the quantity of Soluble and Insoluble Phosphates in a Superphosphate, 10s.—This and the preceding determination generally suffice to show whether the sample is of fair quality, and corresponds with the analysis by which it was sold, but not to fix its exact commercial value.
8. Complete Analysis of Limestones, Marls, Shell-sands, &c., £1.
9. Examining any of the above substances for the quantity of Lime, and ascertaining in the same the presence of Magnesia and Alumina, 7s. 6d.—Ascertaining the proportion of these, 2s. 6d. additional for each substance
10. Complete Analysis of the Ashes of any Plant, £3.
11. Complete Analysis of a Water, £2.

12. Determination of the amount of Salts in Solution, and of the Lime thrown down by boiling in any water, 10s.
13. Analysis of Tile or Fire Clay, £1, 10s.
14. Complete Analysis of Roots, Grains, and other Vegetable Products, £1.
15. Examining products of Vegetation, or of the Dairy, such as Nutritive Matters in Wheat or other grain—quantity of Butter or Cheese in Milk—5s. each ingredient.
16. Determination of the quantity of Nitrogen in any substance, 7s. 6d.
17. Answers to letters asking advice on subjects within the department of the Chemist, 5s.

The charges for other Analyses not specified in the list will be settled by the Committee of Management, with reference to the amount of work which they involve, and on a scale similar to the above.

THE VETERINARY COLLEGE continues to maintain its name, and to attract an increased attendance from all parts of the empire. A list of the students on whom the Society's veterinary diploma was conferred in 1862 and 1863 is annexed; and the Directors have, on behalf of the Society, to acknowledge the valuable assistance gratuitously given by the most distinguished members of the faculty of medicine in Edinburgh, and by the eminent veterinary practitioners who have jointly conducted the annual examination of the College, and whose names afford an ample guarantee for the sufficiency of the test applied, and for the qualification of the gentlemen who have received the diploma:—

April 1862.—James Hunter, Aberdeenshire; John H. Hamilton, Kandy, Ceylon; John Donaldson, Paisley; Andrew Dunlop, Glasgow; John Lawson, Manchester; William Wilson, Sanquhar; John F. Lewis, Hartlebury, Worcester; William C. Wheeler, Cairo, Egypt; Edward Barron, Dublin; Thomas Mellis, Aberdeenshire; Adam C. Robertson, Airdrie; Allan M'Culloch, Glasgow; Andrew J. M'Intosh, Dumfries; John H. Boyce, Adlingfleet, Goole; John Barr, Irvine, Ayrshire; George Sermon, Manchester; Thomas Roberts, Lodge, Chirke, Salop; Peter Lawton, Alderley, Cheshire; John Steele, Biggar; Alex. Morrison, Towie, Aberdeenshire; Wm. Spruell, Paisley; John H. Fergusson, Glasgow; James Ker, Peebles; Robert Scott, Warwick, Roxburgh; David Pollock, Bellshill, Lanark; Alexander Kelly, Edinburgh; Samuel Wagstaff, Leadenham, Lincoln; Thomas Little, Swinefleet, Yorkshire; James Murphy, Dublin; John Gofton, Newcastle-on-Tyne; John Turnbull, Rhynie, Aberdeenshire; Joseph Leather, Eccles, Manchester; John Webster, Kincardineshire; Richard West, Norfolk; Robert Lees, Tarbolton, Ayrshire; James C. Dixon, Peebles; William Fields, Yorkshire; Alfred Brett, Edinburgh.

April 1863.—Francis Horner, Yorkshire; George Percival, Cheshire; Robert Erskine, Dunfermline; Wm. Evans, Co. Cork; Wm. Pallin, Dublin; Nicholas Harrison, Kirkby Lonsdale, Westmoreland; Benj. Smith, Darton, Yorkshire: James Taylor, Co. Down, Ireland; John H. Byrne, Naples, Italy; Benj. R. Kirk, Yorkshire; John Malcolm, Longsight, near Manchester; Edmund Nuttal, Bury, Lancashire; Wm. Eastcott, Broadwood, Devonshire; Charles Merry, Cumnock, Ayrshire; John M'Laren, Yorkshire; Wm. Coupland, Cheshire; Alex. M'Arthur, Ayrshire; Wm. Worthington, Lancashire; M. Hepburn; C. Welsh, Whaley Bridge, Derby; W. E. Duns, Dunse; John Little, Cumberland; Peter Bain, Doune, Perthshire; Hugh Anderson, Newtonards, Ireland; Geo. Oliver, Prestonpans; John Tallontire, Cumberland; H. Hill, Cadis Head, Lancashire.

Since the date of the last report, the diploma in agriculture, under the supplementary charter of 1856, has been conferred on—

William Borthwick Smith, Stoneleigh Villa, Leamington.
John Bailton Hethrington, Burlington Place, Carlisle.

The contract with Messrs Blackwood for printing the 'Transactions' has been renewed for two years from 1st July 1863, subject to an arrangement by which members may obtain the 'Transactions' separately from the 'Journal of Agriculture' for an annual payment of four shillings, and on giving notice to the publishers.

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By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to prescribe a Curriculum for Agricultural Education, and to grant Diplomas.

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ON WEED IN HORSES.

By James M'Gillivray, V.S., Rayne, Insch, Aberdeenshire.

[Premium—The Gold Medal.]

I.—INTRODUCTORY REMARKS.

Excepting colics and diseases of the respiratory organs in the horse, no disease has occurred so frequently in my practice as the disease called "weed." Country people, I presume, from its two most prominent symptoms—suddenness of attack and a swollen leg—have named it *"a shot of grease."*

In writing the following report, it will be understood that my object is to avoid as much as possible the technicalities used by the profession. I am not writing for the purpose of conveying instruction to professional gentlemen; I am simply to give the results of my experience and observation on the disease in question for the benefit of the farmer, the owner of horses; and this more for the everyday guidance in the right and proper management of his horses—in conducting, by their means, many of the most important operations in agriculture, and thus avoiding causes of disease—than with the hope of enabling him to treat them successfully while under its action. Although an attack of the disease called weed very rarely proves fatal, still the farmer looks with dismay when told that a valuable animal in his stock is affected with this disease. Generally he knows that there are two risks attending this attack; first, an animal once affected with weed is very likely to have repetitions of the attack; second, if the affected animal be not actively and properly treated professionally, and unremitting attention paid by those in charge, there is every reason to apprehend a permanently thickened leg, and the animal blemished for life—such blemish deducting half the value of any animal if offered for sale. Most other diseases to which horses are liable leave no blemish; once the disease is removed, it can scarcely be told that the animal has been ill; but in many attacks of weed this is not the case.

In writing out the following report, I have given—first, "the symptoms;" second, "the *post-mortem* appearances," also symptoms; then "the nature of the disease" as deduced from the symptoms, &c.; I have classed "the causes remote and proximate" along with "the *preventive measures*," as in this peculiar affection the *causes* and *prevention* are naturally so mixed together—so inseparable in discussion—that to have given a separate chapter for each would have necessitated so many repetitions as to add considerably to the length of the report, and, to my mind, it would not, after all, have been so coherent, so easy of comprehension, as on the plan adopted; and lastly, I have given the treatment pursued

by myself, which in an extensive practice I have found the most successful.

II.—SYMPTOMS OF WEED.

A horse suffering from an attack of this disease generally presents to the observer two special indications; first, diffuse, *constitutional;* second, circumscribed, *local.* The first is in all cases apparent; the second may not always be apparent, but, I am convinced, is in every true attack of weed. The first, diffuse, is indicated by laborious breathing, a rigor or shaking-fit, distended nostrils, profuse perspiration, conjunctiva and membranes of the nostrils red, inflamed, highly injected—extreme restlessness, ears dangling, the appetite gone, and pulse from 90 to 110. The second, or local, is indicated by the animal standing on three legs; the other leg, useless for the time, cannot be put to the ground so as to support any of the animal's weight. On a superficial examination of this limb an enlargement is found inside the thigh—in the female, at a spot almost opposite the mammæ or udder; in the male, opposite the scrotum. This enlargement is very hot, irregular to the feel on the surface, extremely tender and painful, and generally covered with perspiration. The scientific anatomical examination of the carcass of the horse exhibits three classes of vessels ramifying through and pervading every part of the body. One of these sets of vessels collects the blood from every part of the body, and pours it into the heart; the second set of vessels conveys the blood from the heart to every part of the body, for the express purpose of building up its wasting substance and renovating its exhausted tissues; the third system of vessels contains a colourless fluid named lymph; and this set of vessels are termed lymphatics. Wherever necessary, there are always two groups of these vessels—a superficial and a deep-seated—the superficial generally accompanying the larger veins; the deep-seated take the same course as the large arterial trunks. The commencement of the lymphatic vessels are of the capillary nature, but not small; a pair of good eyes can see them without assistance. They are so much larger than the capillaries of the blood-vessels, that these last are found ramifying on the parietes of the former. These lymphatic vessels are thickly distributed through and over the skin, and indeed are in every part of the body. They are the principal agents in producing absorption when any substance, such as a blister or any preparation of mercury, &c., is applied externally to the surface of the body. The commencing extremities of the lymphatics are said to be shut, so that the entrance of any fluid into them is by imbibition—endosmotic action. Within every living body there must be a constant disintegration of the various parts of such body, of course varying with the nature and economy of the special part. Possibly this waste of substance is partly due to the tissue-destroying action of oxygen; still the disintegrated substances of the tissues will not

be altogether thrown out of the body; such a proceeding would argue prodigality, and would not be in harmony with the known general economy of nature. There may be portions of it capable of reassimilation, for the purpose of repairing the waste of other parts of the body. To accomplish this end the lymphatic vessels of the posterior extremities convey all their contents into another large vessel or sac; the general contents of this sac are supplied from both lacteal and lymphatic sources; this large sac can be very easily seen passing from about the posterior portion of the mesenteric artery forward between the large posterior vein named the *vena cava* and the posterior artery, which, in the horse, is always on the right side of the vertebræ or back-bone. This sac terminates in the thoracic duct, which pours the collected contents of the lymphatics and lacteals generally into the left jugular vein, whence, along with the venous blood, they are sent by the heart into the lungs for purification, then returned to the other side of the heart, and by its impulsive force sent to every part of the body for the accomplishment of the purpose already mentioned. The healthy function of the whole lymphatic system is to convey into the general arterial system those materials that are capable of absorption, whether such materials have an internal or external origin. The lymphatic vessels now referred to are furnished with valves of semilunar shape, and opening in the direction of the heart, thus indicating at once the direction of their contained currents. In addition to the valves with which the vessels now described are furnished, they pass into, or are formed into numerous bodies called glands. The structures of glands have been minutely ascertained and pointed out by several of our best physiologists. I myself have minutely examined portions of glands with very high magnifying powers, but could detect nothing in their structure different from the beautiful diagrams of glands given in Dr Carpenter's 'Physiology.' The specific action of glands, however, is not known, not being indicated by any specialty in their construction or physiological arrangement in their substance. These glands are very numerous at the spot where I have stated the enlargement is to be found in this disease; and, being situated in the inguinal region, they are termed the inguinal glands.

Inflammation of the glands last mentioned is the first special symptom of weed. When they become inflamed there is a stoppage of the lymph, either partial or complete, at the precise spot where the containing vessels enter the gland. As time passes on and the disease progresses, the accumulating lymph increases the inflammatory action by unduly distending the lymphatic vessels; consequently the swelling increases and gradually extends itself downwards over the affected limb. Nothing is being removed from the limb, in so far as the effete, worn-out, or unnecessary matter is concerned, so that the diseased limb may, in that respect, be considered for the time as foreign to the body.

At times all the constitutional symptoms will disappear and the local ones remain: the affected limb refuses to respond to treatment, and the local symptoms become daily more and more aggravated; the leg is becoming larger, stiffer, and more painful; peculiar swellings by-and-by present themselves, commonly about or in the neighbourhood of joints; these swellings, increasing in size, point and burst, leaving ill-conditioned, ugly sores, often directly opposite to important joints. Still I never knew a single case in which the capsular ligament of a joint was penetrated by these sores, the joint never being injured in the least, however bad-looking the local symptoms were, and on recovery of the limb the joints were always sound and supple.

A limb enlarged and swollen by weed presents another symptom—the swelling is much reduced by exercise. This is due to the fact that, in exercising the animal, the muscles of the limb are necessarily alternately contracted and expanded in volume, thereby pressing on and forcibly contracting the lymphatic vessels, the valves of which compel the contents to take the proper direction, and this promotes absorption and the reduction of the leg.

III.—POST-MORTEM APPEARANCES.

I am not certain of ever having seen the carcass of a horse that died from the effects of weed without its being accompanied with some other disease. I have known old and valueless horses that, when severely affected with weed, were sent to the tanyard to be destroyed, &c.; these I have seen. It was my fortune to reside for years in the immediate neighbourhood of a tannery. A very small consideration to the men employed there gave me the privilege of examining every carcass that I expected to learn anything from, or wished to inspect, &c. On reference to my book, I find a *post-mortem* examination of a mare that died from the effects of weed, &c. The disease was more particularly in the right hinder extremity, and, on carefully laying open the affected limb, I found the muscles diminished in size, but otherwise in a healthy state, or nearly so, well coloured, and firm. I found between the muscles and in the subcutaneous tissues—more especially in the areola of these tissues—an enormous deposit of semi-organised coagulable lymph. This deposit was mixed up with a large quantity of thick, yellow, fatty matter; the lymphatic vessels scarcely to be distinguished from the above mass of coagulable lymph and fatty matter; the blood-vessels, both arteries and veins, all pervious and right. The arteries contained very little blood. The veins and right side of the heart were quite full of blood, and in these vessels the contained blood presented much the same appearance at it does when abstracted from the animal in life. The coloured portion of this blood was separated from the buffy coat which stood above (in relation to the side the dead

animal lay upon), was also almost colourless, and had the complete shape of the containing vessels. The glands were so much decomposed as to present little but a putrid mass. Very much of the deposit above mentioned was lodged about the joints, especially the stifle joint. There was nothing wrong about the bone; the periosteum was not discoloured; neither were the cartilages removed from the extremities of bones. Previous to death there were several ulcerous sores opening externally; these were inside and outside the thigh, about the line of the stifle joint, across. Some of these ulcers had burst naturally, and some of them, being likely to burst, were opened by the veterinary surgeon in attendance. The limb was enormously enlarged; I should say three times the size of the healthy one. Internally there was nothing particular to note: contents of the chest healthy—just the appearance of animals that die from the irritation and exhaustion consequent on continued low fever. This mare had a foal twenty-six days before death—a malformation. Severe parturition was the consequence. For ten days subsequent to the parturition she did no work; had fair appetite, perhaps rather delicate, as the milk gave her some trouble: then came the attack of weed, presenting the common symptoms.

In making *post-mortem* examinations, I have met with serum in considerable quantities in the abdomen; also large deposits of coagulable lymph on the mesentery, about the kidneys and walls of the abdomen, and viscera, &c. This deposit, when removed, took along with it the peritoneal covering, and thus left the viscera, walls, &c., in such a state as to preclude any definite conception of the real state of the parts previous to the animal's death.

IV.—NATURE OF WEED.

From the symptoms now detailed it will be plain that the disease under consideration is in its nature inflammatory; that it is characterised by constitutional fever; that there is also a local affection more or less apparent, but sufficiently common to stamp this disease with its own specialty; that this affection is essentially a disease of the lymphatic system; is undoubtedly due to high feeding, irregular exercise, unsteady or deficient work; that there is also a hereditary tendency to it which may descend from sire to son, &c.; that under the above management, or rather mismanagement, horses having this hereditary tendency are more liable to become affected than others; that wherever this disease occurs, there is in the affected animal a disproportion between the nutritive aliment thrown into the body and the assimilative or excretory powers of the system.

It may, in all fairness, be characterised as inflammatory, febrile, and congestive. It is not a fatal disease, but yields readily to rational and scientific treatment; constitutional in common, but in some particular cases requiring local depletion by means of rowells,

setons, &c.; and, in a few extreme cases, works out its own cure by the spontaneous breaking up of the diseased tissues in the shape of ulcers, these ulcers having a prolonged and copious discharge.

Under many circumstances I have examined blood in its varied forms taken from horses suffering from weed, often with very high magnifying powers; and now, while writing these observations, I have, at my own premises, had an opportunity of taking blood from an affected horse. I have just allowed a single drop to fall from his neck and spread on the field of the microscope, examining it as a transparent object before it is three minutes from the circulation. The colouring corpuscles are quite distinct so long as the film is not dry—they instantly group together in irregular masses. As soon as the film is dry, the coloured masses remain visible, but the corpuscles are scarcely distinguishable. The thin film of colourless matter between, contains a few colourless corpuscles, extremely small, and but a few are visible even with very high powers. Independently of individual gravity, the coloured corpuscles have an attraction for each other, and thus they are congregated into masses. Very likely these masses are heavier than the surrounding media—fibrin, albuminose, serum, &c., and may thus descend in the vessel by their own special gravity. This tendency to congregate in groups is augmented, to all appearance, in inflammation—is it a cause or a consequence?

It is certain that an important alteration has taken place in the blood of every horse suffering from weed. In blood abstracted from such animals, I have always found a great tendency of the coloured corpuscles to separate from its other constituents, sink to the bottom of the vessel it may be received into, thus leaving a large portion as buffy coat. This buffy coat often amounts to more than half the quantity abstracted. The mass at the bottom of the vessel is always black in colour, has very little coherence, and is a soft, tremulous, jelly-like substance. The other part, the buffy coat, is deeply cupped, and only very moderately firm in texture. The cupping is due to the circumstance that, while cooling, the mass adheres to the sides of the containing vessel, contracts in volume during coagulation, being more dense then than in the fluid state, and from these conditions it must sink in the middle.

We have seen that this separation of the colouring matter from that which forms the buffy coat, is not altogether due to the greater gravity of the coloured portion; and farther proof is, if a single drop of blood from the neck of the affected animal be allowed to fall on the sloping side of the receiving vessel, and spread as thinly out as possible, the colouring matter, corpuscles, will instantly arrange themselves into groups, leaving the colourless portion a thin film on the vessel, &c.; and this fact is obvious to the unassisted sight. I have observed these circumstances in every case of weed. I have abstracted blood from horses within two hours from the com-

mencement of attack, during the shaking or cold stage. From these circumstances, I am convinced that, previous to the attack, there exists a derangement amongst the elements, their nature or proportions, of which the blood is composed.

From frequent examinations and observations, I conclude that the extreme and constant tendency to separation amongst the elements of the blood, is an unhealthy abnormal state, the bad effects of which will soon manifest themselves in any animal body where such a state exists.

In this disease the albumen seems to be superabundant in quantity for the maintenance of perfect health. It is well known to physiologists that there is not a demonstrable step between health and disease. An inordinate extreme healthy action gives rise to or merges in disease, and I more than suspect that this is the origin of weed. Perhaps the albumen exists in the blood in that state called, by M. Mialhe and others, albuminose—imperfect albumen—in moderate quantities adapted for nutrition. In this state—said to be very deficient in organic compounds—and while the walls of the blood capillaries are impervious to albumen *proper*, this *albuminose* copiously transudes the walls of the vessels, passing into the surrounding tissues in quantities too large for the requirements of the body, or for its ordinary powers of absorption; and from the tendency to permanent enlargement exhibited by limbs affected with weed, I apprehend there must be a proportion of fibrine exuded from the blood capillaries along with the albuminose. In other words, these matters, when effused in such quantities and in unhealthy proportions, although still the elements of proper tissues, yet, under the circumstances, very soon acquiring too low powers of vitality for healthy organisation, are only fit for forming abnormal organisations, or to be expelled from the body, thereby overtaxing the absorbent powers of the lymphatic system; and these not being equal to its removal, its presence produces irritation, inflammation, fever, congestion, enlargement, ulceration, and the consequent death of particular tissues, and at special points of the affected limb. Of course, if nature be properly supported and assisted, resolution may, and generally does, take place, and the affected limb is restored sound as the others.

V.—CAUSES AND PREVENTION.

From many years' extensive practice, and the privilege of having attended and carefully noted the apparent remote and proximate causes, symptoms, progress, and results of many hundred cases of weed in the horse, I am convinced that the disease is incidental to certain conditions arising out of, and accompanying, the domesticated state, the artificial treatment to which the horse is subjected; also, that certain forms of horses are more apt to be affected under the same circumstances. Experience and observation prove that horses

living and working under certain known circumstances are almost completely exempted from attacks of weed; while it is equally clear and known that the same stamp of horses, brought under other circumstances, are affected with this disease. Thus we are forced to the conclusion, that the conditions under which the animals are kept, and the daily treatment they are subjected to, have much to do with the appearance or non-appearance of weed.

The doctrine of prevention being a dark subject, the only ground on which it can be rationally and usefully discussed is the strict and careful examination, and consequent elucidation, of the conditions, circumstances, and their effects, now referred to. Proceeding on the above data, I am convinced that three things contribute to produce this disease. Cause first: A high state of feeding, by which an extra quantity of rich and nourishing matters are thrown into the animal system. In such cases the absorbents, lymphatics, &c., are generally overtasked; their functional operations and powers are inadequate to the labour of removing the superabundant matters altogether from the animal body, or conveying them, as is done naturally, from one part of the body where they are not required, to any other part of the same body where they are needed. Cause second: An abridgment or total cessation of the customary work or exercise to which the animal is subjected. Moderate work or exercise is not only salutary in its effects, but is absolutely essential to the preservation of a healthy state of the body of all animals. Exercise assists in promoting digestion; also in eliminating from the body much of the effete, worn-out matters, in the shape of sensible and insensible perspiration. Moreover, the action of the muscles, that must of necessity accompany exercise, certainly does assist the lymphatic vessels in propelling their contents more rapidly in the proper direction. I have observed that horses which are moderately and uniformly tasked, and at the same time supplied with wholesome food and good water, always the same quantity and at regular intervals, are very rarely affected with weed. For many years I had under my care four relays of four horses each. These horses were employed in dragging a mail-coach the regular stages for seven days a-week. Their work was smart but very regular; their food, corn and hay, of excellent quality, supplied at certain well-known hours, and amongst these horses I never had a single case of *weed*. Again, in the same village, the centre of my professional operations, there were a good few common carriers employing many horses on the road. These horses were very highly kept, their work was very irregular—long pulls of forty miles with heavy loads, then idle, or next to idle, for some days. Nothing was more common than for some of these carriers to put me out of bed on the Monday mornings to attend some of their horses under an attack of weed, the high keep and the Sabbath-day's rest being the means of inducing the attack.

Among farm-horses it is very rare that a case of weed occurs during the busy season of spring, unless there come some unseasonable weather so as to interrupt all farming operations, and also between the Sundays and Mondays. Under these conditions the farmer well knows the frequency with which his horses have attacks of weed. Now, I know that farmers cannot enter into field operations in stormy and bad weather, neither can they work their horses on Sundays; but, under all these circumstances, they can give them plenty of exercise, and restrict their quantity of food. So far as I am concerned, it is well known that for years I have advocated the subjoined plan of treatment:—"On the Sabbath morning, or the morning of any day the horses are to be idle, at the customary hour in the morning give the common quantity of food; at the hour when the horses are generally put to work, turn them round in the stall, or tie up their heads, so that they cannot eat anything until the hour at which they commonly come from work; and during these yoking hours, give them one hour's smart exercise—one hour's quick trotting being equal to four hours' field labour. If the season be one for two yokings, then act as above twice a-day; and if circumstances be such as that exercise cannot be given to the horses, then withhold part of the ordinary rich keep, &c." These simple injunctions being attended to, I am quite confident that few cases of weed would appear.

Strangely enough, since the above was written, several circumstances have occurred confirming the principles advocated. In the present season the harvest is unusually late. For one month preceding the commencement of harvest operations, horse-work was about *nil*. Farm-horses have been all but idle for the last six weeks. For one month previous to this date, 6th October 1862, I have had a greater number of cases of weed in the horse than I had in all the preceding eighteen months. On one day I had four fresh cases of weed—three occurring on one farm. In many cases horses have lately been largely supplied with green tares mixed with corn fresh from the field; the corn is now ripening fast, and I have no doubt the corn and tares are at present a very rich and nutritious food, and, coupled with the absence of work, very likely to assist in producing such a state of the circulation as is the antecedent of weed.

Horses employed for conveying gentlemen's carriages, &c., are not so liable to become affected with weed as are horses employed at farm-work. There are two reasons for this: First, The breeds generally employed as carriage-horses are not naturally so subject to attacks of weed as are the more clumsily formed horses used for slow work; secondly, Horses employed for agricultural operations are neither so uniformly wrought or so regularly exercised as are carriage horses. Confirmatory of these principles is the fact, well known to many, that a horse suffering from weed, if able to travel at all, if compelled to leave the stable and take even a little exercise,

will get much sooner better, even taking into account the severity of the attack, than one that is allowed to mope about in the stable, with little exercise and few attempts made to take him out.

Cause third: There is the selection of horses to breed from. Even amongst the so-called farm-horses there is a natural variety. I firmly believe that certain *forms* of horses are more liable to attacks of weed than are horses having other and different forms. It would be rather out of place here were I to enter at any length into a detailed description of the various forms of horses to be met with in a country practice. I shall only give a short extract on the point in question from the celebrated work on the horse by Blaine, as I have met with nothing better adapted, &c. "The knee of the horse, like the joints generally, should be large, by which the surface of muscular and ligamentous contact becomes increased, and the stability of the limb in proportion augmented; by this form also the tendinous insertions are farther removed from the centre of motion, and thereby their power is increased. The canon or shank follows the *knee* or *hock*, and the perfection of its form throughout is important, as here there are no fleshy masses, but purely tendinous matter; and, as the bone itself is sufficiently solid, so it is not the circumference but the *breadth* of the part that is requisite to form a *good shank*. The tendons themselves, which are the *back sinews* of horsemen, should continue broad downwards, forming a surface of great lateral width, but which should be thin posteriorly; the mass of sinew itself should, however, be considerable, and very firm." When these tendons and their coverings are swelled, and rounded, as it were, into one mass with the bone, leaving no distinctive marks between the one and the other, either there is, of these parts, a *bad conformation naturally*, or they have been sprained, or most likely there may have been repeated attacks of weed, leaving the limb with an unsightly and permanent thickening, and, of course, very subject to renewed attacks of weed.

The circumstances now detailed are partially known amongst farmers. There is also an impression current, that if a mare having a tendency to attacks of weed do become pregnant, have a foal, and suckle the same, she—the mother—will by these means be cured of her constitutional tendency to attacks of weed. I must confess, however, that I have not collected data sufficient to enable me to say if this *is* or *is not* correct; but I am pretty certain that, in seven cases out of ten, foals produced and reared under such circumstances will have the unenviable distinction of being constitutionally and physically inclined to weed; and, to look at, clumsy, and for work will prove actionless brutes. From a consideration of these circumstances, the breeder of horses will see the necessity of exercising great care and skill in the selection of animals to breed from, as very much depends on the nature and constitutional peculiarities of a stock, both for comfort and profit afterwards.

Prevention by Medicine.—I have made direct experiments with common nitre, by allowing a portion of blood from a horse's neck to flow into a weak solution of nitre, and from the same wound taken another portion of the same blood into a second vessel without the nitre. The nitre did prevent the coagulation of the fibrin and the grouping together of the colouring corpuscles of the blood, preventing the separation of the blood elements. However, we possess no certainty that nitre has the same effect when introduced into the active circulation of the living animal. Still I find it always acts on the kidneys, and, by increasing their activity, becomes a valuable agent in eliminating from the body much of the worn-out matters, &c. The farmer would give with advantage to every horse a half-ounce dose of nitre in soft meat every night for a week at one time. This might act as a preventive of weed, especially when horses are idle. And the following course of six doses could be repeated, allowing one week to pass between:—

℞	Nit. pot., ...	℥ iij.
	Flor. sulph., ...	℥ j.ss.

Mix, and divide into six equal parts, one every night, as above.

VI. THE TREATMENT OF WEED.

The presence of a majority of the symptoms already detailed will make an attack of weed apparent and certain. A physic ball should be administered at once, unless the affected animal may have been labouring under any other disease which precludes the use of depletive measures, such as colds, strangles, influenza, &c. The horse affected with weed, and free from other diseases, should have a ball composed of

℞	B. B. aloes, . . .	ʒ vij.
	Calomel, . . .	ʒ j.
	Ginger pulv., . . .	ʒ j.

Mix, and make up with spirits of wine. I give the preference to spirits over any other substance for the purpose of forming an aloetic ball. I do so for this reason: the aloes is a *gum resin*—*i. e.*, composed partly of gum and partly of resin—and, if the ball is made up with lard or palm oil, as is commonly done, then the resin has no proper solvent menstruum, perhaps not in the stomach of the horse; but if the ball is formed with spirits, the resin is at once dissolved, and the gum portion of the ball will be dissolved in the fluids of the stomach. The horse having got the ball, should have plenty of exercise up to the time that the ball commences to operate—generally from twenty-two to thirty hours. Immediately after the administration of the ball, take from three to five quarts of blood from the neck. I do not approve of bleeding from the affected limbs in

such cases it is always taken from one of the larger veins, and, after all, is only blood taken from the general circulation; it is no real local blood-letting, and can, consequently, have no advantage over the same quantity abstracted from the neck. I have seen bad consequences follow the abstraction of blood from the saphena vein—the large and prominent vein on the inside of the thigh, or the plate vein, inside the forearm, &c.

Fomenting the tumified limb with very warm water does much good, if only persevered with. It relaxes the vessels, encourages perspiration, a freer circulation, and, in some degree, restores the deficient absorption. By these means relief is given to the pain and stiffness. Gentle exercise also should be given, increasing its smartness as the animal can bear it.

During the action of the physic, however, the animal should not be moved out of the stall—about twelve motions is considered sufficient. After the operation of the purge is fairly over, the animal should have plenty of exercise or light work. During work the swollen limb is generally much reduced in size. Should it fill up during rest, or during night, then a flannel bandage, 6 feet long and 4 inches wide, should be got and applied to the affected leg when it is reduced by exercise to its smallest dimensions. Of course, the application of the bandage commences at the pastern, and is continued very tightly up the leg, &c.; this bandage to be removed before the animal is put to exercise or work. Should there be a tendency to swell in the rest of the limbs, which is not uncommon, then apply the same sort of bandages, after the same manner, to all the legs. The tight bandaging, by its uniform and timely pressure, assists the relaxed vessels to contract and resume their natural calibre, and thus absorption is also promoted.

Three days after the operation of the physic ball is fairly over, the following powder may be given with advantage:—

℞	Tart. anti.,	. .	ʒ vj.
	Flor. sulph.,	. .	℥ j.ss.
	Nitre,	. . . .	℥ iij.
			Mix.

To be very intimately mixed, and divided into six equal powders—one of these to be given every night in soft meat. In rather severe cases, let a half-ounce dose of nitre be given every morning in soft meat, and the nitre continued nightly for one week after the above six doses of compound medicine are all served up.

Occasionally the limb affected with weed will remain tumified and stiff, although not so painful as at the commencement of the attack. It is the more likely to do this if there have been several previous attacks of weed in the same limb. Should it continue in this state for some two or three weeks, then I put a rowell inside the thigh, about three inches below the stifle-joint, and four inches beyond the part you can see when standing opposite the animal's side.

The rowell itself should be about two inches broad, and smeared daily with the following digestive ointment:—

℞ Yellow resin,	. .	ℨ ij.
Venice turp.,	. .	ℨ j.ss.
Lard,	. . .	℥ j.ss.
		Mix.

The rowell should also be turned round so far daily, and the place well cleansed: carry on thus for three weeks. If weed occur in a fore-limb, then I insert the rowell between the fore-legs. I have now and again used a seton in place of the rowell: it can be kept much longer in operation than the rowell.

If the treatment now pointed out be properly carried out, I have rarely seen it fail in restoring the animal to its wonted health, vigour, and suppleness of limb. At times, however, cases will occur that do not terminate so satisfactorily. I have mentioned that opposite to joints there are the lymphatic glands, often numerous glands; I have also said that the inflammation and consequent obstruction of these glands in some locality or another are the principal features in this disease. In some few cases the glands in the neighbourhood of joints become enormously enlarged; are on slight pressure exceedingly tender; the constitutional fever remains, although in a modified form; ultimately these glands ulcerate, burst, discharging a large quantity of semi-purulent stuff, each ulcer being a most ugly wound, with rugged, loose, and flabby edges. About the worst case of weed that I have seen ultimately do well was a young and strong grey mare. This mare had repeated attacks of weed, so far as I recollect, always occurring in the left hind leg. From these repeated attacks, with the ordinary treatment, she always got better, but the affected limb became gradually thicker after each attack. In the autumn of 1848 this mare had a most severe attack of weed. The whole leg became immensely enlarged from the udder to the hoof. She could scarcely move it, could not lie down, and, of course, was a case for the sling. About the common treatment was adopted; and, at the customary period from the latest attack, I put a rowell in the usual place: no improvement. After a few weeks the tumified limb pointed at five different places, one on each side of the leg at the fetlock-joint, one on each side of the leg at the hock-joint, and one at the inguinal glands opposite the udder. I dressed these sores with diluted chloride of lime. During the first ten days they were open. Twice a-day I had injected into them a liniment composed of olive-oil and spirits of turpentine, equal parts; ultimately following up this treatment with the *white lotion:*—

℞ Acetate of lead,	. .	℥ j.
Sulphate of zinc,	.	ℨ vj.
Cold water,	. . .	One pint.
		Mix.

At my earnest request the owner did not destroy this mare, although

at one time she was a hopeless-looking patient. After a while the sores all healed finely, and the owner sold her. Knowing the gentleman who purchased her, I last week took the liberty of writing him concerning her, and subjoin his answer :—

"C——e, *September* 18, 1862.

"Dear Sir—I have your letter in regard to a grey mare I bought from Mr B—e of B—d. I never saw any appearance of *grease* * about her while in my possession, and I am of opinion that she was cleared of grease. I never saw anything the matter with her health. I bought the mare coming five years old. She was a completely worn-out beast when I bought her. She is twenty years old now," &c. &c.

I have recorded another curious case of a mare which also had an attack of weed in a hind-leg. This limb continued extremely tumified, especially about the hock-joint, and after a while it pointed and burst on each side of the joint, near the *os calcis*. The mare was very much exhausted, and I advised the owner to have her slung. He neglected to do this. She lay down, and, in her struggles about getting up, tore the skin over the *os calcis* across, between the two sores. I never saw an uglier leg; yet this mare did well, although she was a long time badly. The treatment in this case was the same as that recorded.

For these ulcerous unhealthy sores I have found nothing equal to Beaufoy's chloride of lime or soda, diluted with four parts of water. The application of this diluted wash twice a-day, with perfect cleanness, often works almost wonders in the way of bringing about a healthy action.

As regards cases where an attack of weed affects more than one of a horse's legs, although rare, yet I have met cases where all the four legs were so affected. Still, the local affection being diffuse, constitutional treatment is always equal to meet such cases, and in these I have never found local treatment necessary.

* Grease—the vulgar term for weed.

FISH OFFAL.

By Robert Scot Skirving, Camptown, East Lothian.

[Premium—The Gold Medal.]

Two years ago I received a printed document, with a foreign post-mark, the general purport of which I was able to guess at from a few leading words scattered through it, but it was some time before its full import was explained to me by a friend.

It was an account, in the Norwegian language, of what it rather inexactly called "fish guano," and the following is a translation of its chief passages:—

"The renowned Professor of Agricultural Chemistry at Tharand, Dr Stöckhart," it says, "gives the following information as to the use of Norwegian fish guano in Germany:—

"The comparative value of fish guano and of good Peruvian guano may be thus stated: The first summer, one Norwegian pound of fish guano applied to spring wheat and oats produced, in twenty-five separate experiments, an average result of 6.1 pounds of grain. On the other hand, one pound of Peruvian guano, applied in a like manner, produced, in the same number of experiments, 6.3 pounds of grain. One pound of fish guano applied to potatoes and to mangold produced, over an average of seventeen experiments, 15.6 pounds of roots; whilst one pound of Peruvian guano, used in a like number of experiments, produced an average result of 17.3 pounds of roots.

"The first set of these experiments shows that fish guano and Peruvian guano, when applied to spring corn in equal quantities, produced nearly similar results.

"A comparison of the fish guano here used with that which is so largely exported from Lofodden, shows that the former contains about a fifth more nitrogen, but that the latter possesses about two-thirds more phosphoric acid. These two varieties may therefore be considered as equally good. Fish guano is applied in the same manner as Peruvian guano, but it must not be harrowed down too deeply, because its chief component parts (flesh and bone) must undergo decomposition, and to effect this the access of air is necessary. Fish guano is most successful (in Germany) when applied to autumnal crops, and it may then be used alone; but perhaps the most profitable mode of application is in conjunction with farmyard dung; and in spring it may be mixed with a third or a fourth of its bulk of Peruvian guano. Chalk also forms a good mixture."*

So far the "renowned professor." The document goes on to say that "perfect information of the effect of fish guano as used in

* Chalk appears a very poor addition when put as an alternative with guano.

Saxony (Prussia), Mecklenburg, Holstein, and Bavaria, may be found in 'Der Chemische Ackersmann' for 1857, pages 151-162;" and we are also informed that "its sale is undertaken by Mr F. H. Frolich of Christiania, and by Mr H. Lundgren of Throndhjem."

The paper did not contain any chemical analysis of the manure.

The only experiments I had ever seen tried with fish offal as a manure were made either with the unprepared debris of fresh fish, or with the refuse of herrings from a curing stand. Neither of these produced satisfactory results; and the latter, from the quantity of salt it contained, exercised a detrimental influence on the crops.

The fish guano, or rather fish manure, which forms the subject of this paper, is widely different in appearance from either of these two articles, being in the form almost of a powder, and perfectly dry. It is composed of the heads, bones, and skin of fish (chiefly the cod), dried in the sun, and afterwards ground into fine particles by machinery. In 1860, a sample of this manure having been sent as a specimen to Professor Anderson, that gentleman was so obliging as to forward it to me in order that it might be tested with the turnip crop that year. This I accordingly did, contrasting its effects with those of a considerable number of other manures, and the result was so satisfactory that I was induced to procure a quantity from Norway, with which I made a further experiment on the crop of 1861.

While it is this last mentioned experiment only which I can present in a satisfactory form, I may, in the first place, give some account of the trial made in the previous year. It was undertaken without any view to the publication of its results, and therefore, though conducted with care, the account I shall give of it will not be in any regular or complete form. The experiment proved, satisfactorily to myself, that Norwegian fish-bones is a sound and useful manure, capable of producing a fair crop of swedes on moderate land without assistance from any other fertiliser.

The field on which the experiment was made is far from being naturally rich; it is indeed rather the reverse, being, in fact, the side of a bank or hill, the rock being not far from the surface. At the same time the soil may be said to be fair, sharp turnip-land.

Plots, consisting of six long drills each, were manured with the fish-bones, and with the substances with which I wished to contrast it. The turnips were swedes; and as no farmyard or other dung had been used during several previous years, the test was a severe one.

The various manures were sown in the drills by a machine, the quantity being to some extent regulated by the nature of the substances themselves, some of the compositions passing more quickly through the machine than others. It was therefore only after each plot was manured that the exact quantity actually placed upon it could be accurately ascertained. The weight of roots per acre being

in this instance the result of calculation founded on a small portion weighed, the quantities given may not be exact, but the relative proportions are, I have no doubt, very nearly correct.

The following is a note of the experiments :—

No.	Manures used.	Weight put on Plots.	Produce per Imp. Acre.	
		Stones.	Tons.	Cwt.
1.	Peruvian Guano,	11	15	13
2.	Concentrated Manure,	21	20	0
3.	Fish-Offal,	17	20	3
4.	Phospho-Peruvian Guano (Townsend's),	19	13	10
5.	Peruvian Guano,—Bolivian and Superphosphate,	18	18	11
6.	Hodson's Ammoniacal Manure,	19	18	5
7.	Phospho-Peruvian Guano (Lawson's),	19	10	10
8.	Peruvian Guano,	20	26	10
9.	Townsend's Turnip Manure,	22	22	9
10.	Peruvian Guano, Bone-dust, and Dissolved Bones,	18	19	4

With the exception of trying one plot (No. 1) with only half an allowance of Peruvian guano, the intention was to place a uniform weight of manure (say 20 stones) on each plot, and it was my calculation that this would have been at the rate of 7 cwt. per imperial acre. For the reason already given, almost no two plots received exactly the same amount, the fish-bones being distributed to the extent of 17 stones only, the others (with the exception of No. 1) varying from 18 to 22 stones, which would have made a material difference on an acre. It is not the purpose of this paper to enter into the merits of any of the special manures which were used in the experiment, the single object being to contrast the effect of fish offal with a number of well-known fertilisers. I shall only remark, with regard to phospho-Peruvian guano, that I am well aware that it is constantly used with a profit in many localities. It is possible the nature of the weather during the summer of 1860 may have affected it unfavourably. That plot which was manured with the larger quantity of Peruvian guano stood out above all the rest from its greater exuberance of foliage, and, stretching as it did across the centre of the field, it looked during summer like the back-bone of the crop.

The second experiment with Norwegian fish offal was made in 1861, on a crop of purple-top turnips. From unavoidable circumstances, the seed was not sown till too late, viz. the 25th of June, and in consequence, no doubt, of this delay, the weight of the crop over the whole field was considerably less than it would otherwise have been. This is the more certain, because, from the very first brairding of the seed, the whole field gave a promise of being a very full crop. Nothing could exceed the healthy and vigorous appearance of the turnips during summer, and their growth seems to have

been checked by the cold nights of autumn before they had attained their full development.

The field used is a good loamy soil, and is naturally much superior to that on which the fish manure was used the previous year. As in the former case, no dung was applied to the crop, nor had the field received any for several years.

The enclosure, which extends to about 20 acres, was divided into four portions, which were respectively manured with—

1. Norwegian fish offal.
2. Peruvian guano.
3. Peruvian guano, bone-dust, and dissolved bones.
4. Townsend's turnip manure.

All the turnips brairded freely in a regular manner, and advanced without a check till the 29th October, when sharp frosts began to be experienced at night, arresting the vigorous plants before their maturity—a penalty paid for the lateness of the date at which they were sown. On this occasion the tops of the turnips grown by the fish-bones were equally luxuriant with those produced by the guano, and both of these lots exhibited a more redundant foliage than that of the other two divisions. It was intended to manure the ground at the rate of 7¾ cwt. per *Scotch* acre; but the machine distributed the two guano lots at the lesser rate of 7¼ cwt., or 5.748 imperial. On reading accounts of experiments I am at a loss to know how the quantities of manure used are always exact. The experimenters are either much better managers than I am, or are much more easily satisfied with the work of their machines, or the manipulation of their servants. It is easy to measure off one acre or ten acres of land, and to allocate for them a specified quantity of manure, and if applied by the hand it can certainly be so used; but I doubt the equalness of its distribution; and it may be observed that labourers are always inclined to use more manure than the quantities ordinarily quoted as applied to land. On the other hand, it may be possible to procure a machine which will distribute guano, or any other individual manure, at a regular rate; but it would require a number of trials before the experimenter could discover how to change the regulator in order to distribute a new manure at the same rate as the guano. Substances equally pulverised do not necessarily pass through a machine at the same rate; the distribution being facilitated or retarded by other conditions of the manure. In this instance, the Peruvian guano, and guano and bones mixed, were distributed equally, being at the rate of 5.784 cwt. per imperial acre; the fish offal and Townsend's turnip manure were also equal to each other, being at the rate of 6.343 cwt. per imperial acre.

Proceeding to ascertain the result of this trial, an acre of each, consisting of very equal soil, was selected, measured, and weighed on the 4th January 1862. So apparently equal were all the four divisions of the field, that it was impossible, by judging from the

eye alone, to determine which was best; but all *looked* a much heavier crop than the result proved to be the case:—

No.	Manure.	Rate per imperial acre.	Price per ton.	Produce of roots per imperial acre.	Value of manure per imp. acre.	Value of roots per acre at 15s. per ton.
		Cwt.	£ s.	tons cwt. st. lb.	£ s. d.	£ s. d.
1.	Fish Offal . .	6.343	9 0	17 14 2 4	2 17 0	13 5 8
2.	Peruvian Guano .	5.748	12 10	16 12 6 12	3 11 9	12 9 8
3.	Peruvian Guano, Crushed Bones, & Dissolved Bones	5.768	10 0	17 6 3 6	2 17 5	12 19 9
4.	Townsend's Turnip Manure	6.343	8 5	18 12 6 12	2 12 2	13 19 0

Several of the prices of the manures given above require explanation.

The cost of the fish offal is set down at £9 per ton. This is the price, I have learned, at which the merchants in Norway offer to deliver it at Leith, or £8 free on board. The actual cost to me was £10, 7s. 6d. per ton, but it was imported in a comparatively small quantity for myself in a steamer, and consequently the charge for freight was high. Its value, per the analysis herewith given, is not more than £8, 2s. according to Dr Anderson's formula. With regard to Townsend's turnip manure, the price marked, £8, 5s., is what was charged in Glasgow, after deducting 5 per cent for ready money.

In the experiment of 1860 the Peruvian guano outstripped the other manures, whilst in the present trial it ranks the last. In both cases I believe the samples to have been of the best description, having been bought from a merchant in whom I have too much confidence ever to think of analysing. To some extent the difference may be attributed to the fact that, in 1860, the rate at which the guano was applied was nearly the highest in the list, whilst in 1861 it was lower than the fish offal or the Townsend's manure.

A mixture of guano with bones in some form has generally given, in my experience, more satisfactory results than when the guano was used alone; and no doubt fish offal ought also to be mixed with other manures, but it is when applied alone that the merits or demerits of a new fertiliser can be most effectually tested. It is within my own knowledge that two other agriculturists in different counties have experimented with Norwegian fish offal with satisfactory results, and my own experience of it seems to prove, that it can at least hold its own with Peruvian guano and other approved manures.

The important question of supply then arises. If our supplies of guano are to fail, we cannot afford to neglect anything that can in any degree supply so terrible a want. Fish offal is at least a genuine and honest manure, with no mystery or suspicion of any kind attaching to it. It is clean, portable, dry, finely pulverised, and easily handled.

From Norway, or any other part of Europe, the supply may be limited; but have we not a wider field of our own where a harvest may be reaped? In the fisheries of Newfoundland many thousand tons of this very offal are annually thrown into the sea. The captain of a vessel, engaged for a number of years in the Newfoundland fisheries, lately informed me that he has frequently seen a perfect stratum of fish-bones and other offal, several feet deep, thrown up on the beach by the sea. The collection of such stores might add as much to the fertility of our soil as the sewage of great cities, about which so much is said and so little done. The preservation of the fish offal would certainly be of much easier accomplishment. It is not all thrown away, because the French have already discovered its worth. The heads and other offal of cod and ling and skate are dried on the rocks in the blazing summer sun, and then carried to France and ground to powder by machinery.

The following are analyses, by Dr Anderson, of the substances used in the experiment, with the exception of the Peruvian guano, which I presume to have been a fair sample.

ANALYSIS OF NORWEGIAN FISH OFFAL.

Water,		13.02
Organic matter and ammoniacal salts,		49.40
Phosphates,		30.26
Carbonate of lime,		1.20
Alkaline salts,		5.89
Sand,		0.23
		100.00
Ammonia,	7.76	

ANALYSIS OF GUANO AND BONE MANURE.

No. 3 of Experiment.

Water,		14.86
Organic matter,		23.17
Biphosphate of lime,		5.09
(Equal to 7.95 soluble phosphates.)		
Insoluble phosphates,		24.70
Sulphate of lime,		22.90
Alkaline salts,		5.38
Sand,		3.90
		100.00
Ammonia,	5.35	

ANALYSIS OF TOWNSEND'S TURNIP MANURE.

No. 4 of Experiment.

Water,	12.09
Organic matter,	21.26
Biphosphate of lime,	13.20
(Equal to 20.55 soluble phosphates.)	
Insoluble phosphates,	3.45
Sulphate of lime,	40.93
Alkaline salts,	5.72
Sand,	3.35
	100.00

Ammonia, . . 1.59

PROCEEDINGS IN THE EDINBURGH VETERINARY COLLEGE.

By Professor Dick.

Summary of Cases, comprising Diseases, Injuries, &c., amongst Domesticated Animals, registered in the Clinical Transactions of the Edinburgh Veterinary College, which have been under treatment during the months of January, February, and March 1863.

	Horses.	Cattle and Sheep.	Dogs, Pigs, &c.
Abscesses in various parts,	14	2	...
Abortion,	...	1	...
Apthæ Epizootica (murrain),	...	23	...
Bones, fractures and injuries of,	6	...	2
Brain, diseases of,	3	...	...
Broken knee,	1	...	...
Bursæ, distension of, with lameness,	4	...	...
Capped hock,	1	...	...
Castration,	6	...	5
Catarrh and sore throat,	44	...	1
Chorea,	...	...	1
Colic,	31	...	...
Colon, rupture of,	1	...	...
Constipation (obstinate),	1	...	2
Cracked heels,	10	...	...
Curbs, with lameness,	6	...	...
Debility,	3	...	...
Diabetes,	4	...	...
Diarrhœa,	1	...	...
Distemper,	...	...	4
Examinations as to soundness,	39	...	...
Eyes, diseases of,	4	...	4
Eyelids, inversion of,	...	...	2

	Horses.	Cattle and Sheep.	Dogs, Pigs, &c.
Feet, corns in, with lameness,	10	...	...
„ inflammation in,	2	...	...
„ navicular disease in,	33	...	...
„ pricks, &c. in,	22	...	...
„ quittors in,	2	...	...
„ sandcracks in,	4	...	...
„ seedy toe,	1	...	...
„ side-bones,	4	...	...
„ wounds and bruises,	18	...	...
Foot-rot sheep,	...	25	...
Frost-bites,	8	...	...
Glanders,	1	...	...
Grease,	3	...	...
Heart, diseases of,	2	...	...
Indigestion, chronic and acute,	9	3	1
Influenza,	31	...	...
Joint ill,	...	2	...
Jaundice,	...	1	...
Lameness, elbow,	1	...	...
„ coronet,	2	...	...
„ fetlock,	8	...	...
„ hip,	10	...	...
„ hock,	8	1	...
„ knee,	2	...	...
„ pastern,	2	...	...
„ shoulder,	1	...	...
„ stifle,	4	...	...
Leucorrhœa (whites),	...	1	...
Mammitis,	...	1	...
Mange,	9	1	3
Nasal gleet,	2	...	...
Over-exertion,	1	...	...
Paralysis,	...	...	1
Parturient Peritonitis,	...	1	...
Parturition, difficult,	...	2	...
Patella, luxation of,	1	...	...
Pharyngitis,	1	...	...
Pleurisy and Pneumonia,	5	...	...
Pleura Pneumonia,	...	2	...
Phthysis Pulmonalis,	...	1	...
Poll evil,	1	...	...
Purpura Hæmorrhagica,	2	...	...
Ringbones, with lameness,	1	...	...
Roaring, thick wind, &c.,	6	...	...
Scalded legs,	2	...	...
Spavin, with lameness,	6	...	...
Spine, injuries of,	3	...	...
Splints, with lameness,	3	...	...
Sore backs,	2	...	...
Sprains, tendons and ligaments,	21	...	...
„ muscles,	2	...	1
Starvation,	1	...	...
Stomach, distension of (hoven),	...	2	...
„ rupture of,	1	...	...

	Horses.	Cattle and Sheep.	Dogs, Pigs, &c.
Strangles, ...	10	...	...
Stringhalt, ...	3	...	...
Teeth, diseases, &c. of, . .	3	...	...
Tetanus, ...	2	...	...
Treads, ...	1	...	...
Tumours, various, . . .	11	...	2
Vagina, cancer of, . . .	...	...	1
Vomition, ...	...	...	1
Weed, ...	7	...	...
Worms, intestinal, . . .	5	...	2
Wounds and bruises other than feet,	28	1	2

GENERAL ABSTRACT.

Cases amongst horses, ...	507
„ „ cattle and sheep, . .	70
„ „ dogs, pigs, &c., . . .	35
	612

During the quarter ending March 31st, the cases registered have not only been more numerous than those of the preceding quarter, but also of a more varied character. Many of them were very interesting, and singly would have provided sufficient matter for a lengthened report to the pages of a purely professional journal. The fact, however, of the majority of our readers being more interested in the preservation of and restoration to health of the domestic animals than in the mere technicalities of the diseases to which they are subjected, leads me to think that a brief notice of a few cases is preferable to, and would be more interesting and useful than, a long scientific article on one, however replete with interest that case might be to a veterinary surgeon.

Amongst the cases of fractures of bone recorded there is one worthy of a short notice. A Clydesdale horse, belonging to a corn-miller in the city, whilst dragging a heavy load up a slight incline, slipped, fell upon his knees, and his nose at the same time struck the ground heavily. On rising, blood was found flowing freely from his mouth. On examination, the lower jaw was found to be fractured in the space between the incisor and molar teeth, a large splinter of bone protruding from the gums. This was carefully removed, the wound dressed with a gentle stimulant, and a dose of laxative medicine administered, strict orders being given to the man in charge to feed on sloppy food. These orders being strictly attended to, the wound healed rapidly, and in a very short time the animal was enabled to return to his work without showing any untoward symptoms.

The next cases on the list worth noticing are those of diseases of the brain, in two of which the animals were destroyed at their owners' request, while the third recovered under treatment. The first occurred in a black mare brought to the College from Fife, on

the 4th of January, for examination. The owner, who accompanied her, stated that for a considerable time the mare had shown peculiar symptoms, which, in spite of all treatment, had gone on gradually increasing in intensity. He wished to have my opinion whether it would be advisable to try further treatment, or to destroy her.

The symptoms described somewhat resembled those of megrims or vertigo, and were a peculiar bearing of the head to one side (the near one), a sort of spasmodic tendency to run backwards if suddenly checked, glassiness of the eye, with partial stupidity. When put to work, she would after a while stop suddenly, look dull and stupid, fall to the ground, and, after a few struggles, become almost insensible. After remaining in this partially insensible state for a short time, she would rise up, look vacantly round, and then go on with her work. These symptoms led me at once to diagnose the case to be one of serious cerebral lesion, or of tumour in the brain; and as they had gone on gradually increasing, both in intensity and in frequency, in spite of all treatment, such as blood-letting, laxatives, and nervine tonics, I recommended the owner to have her destroyed. This was done, and a careful *post-mortem* examination made in the owner's presence. All the internal organs were found to be in a perfectly healthy state, with the exception of one of the ovaries and the brain. The near-side ovary was found almost double its natural size, and, on cutting into it, it was found to contain a quantity of watery fluid, enclosed in several small sacs or cysts, along with a kind of fibrous degeneration of the remainder of the organ. On cutting into the brain, the choroid plexus of the right side was found very much enlarged, and attached to it, and protruding into the lateral ventricle, was a large fatty tumour—this latter evidently the cause of all the peculiar symptoms.

The two remaining cases afforded both good examples of inflammation of the brain, and both proceeded from external injuries. The one, by powerful antiphlogistic treatment, recovered; the other, which I am about to notice, was destroyed. It occurred in a hack horse belonging to a gentleman in the city. On the 13th of March he was found standing in the stable with his head depressed and inclined to one side, eyes staring, pulse quickened, and breathing hurried. On being moved, he seemed to have lost the power of his limbs, more particularly those of the off side, accompanied with a peculiar twitching of the off fore-leg. On attempting to turn, he staggered, at the same time throwing his head violently up. On trying to rouse him, he became excited. These symptoms gradually increased, until at last he dropped down, his eyes became red, and appeared as if starting from their sockets; he panted, and at intervals became almost frantic, dashing himself about most violently. Mr Moir, V.S., an old pupil, who first saw the case, diagnosed it to be one of phrenitis, proceeding on to the formation of an abscess; which

opinion was confirmed by my assistant, Mr Worthington, who was called in to see the case. The owner, not wishing to prolong the poor animal's sufferings, ordered him to be destroyed. This was skilfully done by Mr Moir by what is termed pithing—that is, dividing the spinal cord in the opening between the first and second bones of the neck. On inquiring into the previous history of the case, the groom stated that three or four days before, the horse, on going out of the stable, had struck his head violently against the top of the doorway, which blow had made the animal appear for the time, and a short period after, somewhat stupid. This, however, going off, nothing more was thought about it, until the violent symptoms above noticed made their appearance. The treatment adopted was blood-letting, purgative medicines, and the dashing of cold water on to the head; the latter, if anything, increasing the violence of the symptoms. On making a *post-mortem* examination, the skin covering the poll was found quite entire, as were the bones; but on removing the roof of the cranial cavity, the coverings of the brain, more especially those on the left or near side, were found highly congested. On removing these coverings, the substance of the brain on the same side was found greatly injected with blood; and on making a vertical section on a level with the bottom of the fissure dividing the right from left hemisphere, a dark spot was found in the anterior part of the brain substance; and in the centre of this spot was a small abscess, about the size of a field bean, containing about a fluid drachm of matter,—the cause, without doubt, of all the poor animal's sufferings.

Amongst the cases of pricks in the feet recorded, is one worthy of a few remarks, from its practical bearing, and from the fact of numerous similar cases having come under my notice. In the middle of February, a horse belonging to one of the railway carters was brought to the yard, the man stating that he had injured his back from slipping during the frost. The poor animal was scarcely able to drag himself along, the hind-quarters dropping under him at every step. In fact, this apparent loss of power in the hind-legs had all the appearance of a horse jinked in the back. On making inquiries of the man in charge, he stated that the horse had been in that state for several days—that they had slung him—given him a dose of purgative medicine, and kept cold-water cloths continually applied to his loins, but without any benefit. On seeing him walk, or rather stagger across the yard, I at once concluded that the seat of mischief was the feet, and not in the loins—in a word, that he had been pricked in both hind-feet. I ordered him into the forge, and had the shoes removed and the feet carefully examined. On removing the first shoe, I saw that he had thick strong soles, and these I caused to be well thinned, so that I might be able to make an impression on the sensitive parts beneath with the pincers when pressed. On doing this at one point, the pain induced almost

brought the animal down upon the blacksmith who was holding up the leg. On further examination at this point, I found that one of the nails had been driven into the sensible part of the foot. Following this nail-hole upwards with a small drawing-knife, a large abscess was laid open, when a quantity of pus made its escape. On further search being made, it was found that nearly the whole sole, and also part of the inner quarter, was under-run. The whole detached horn was removed, the shoe tacked on with a couple of nails, and the other foot examined in a similar manner, and with like results. The second shoe was then tacked on, the parts stuffed with tow and tar, so as to prevent the entrance of extraneous substances or dirt from the road, orders being given to have both dressings removed on the arrival of the animal at its stable, and the feet placed in poultices, so as to allay the inflammation. This was done, and the parts thus relieved speedily took on the healing process, and in a very short time the horse was able to return to his work.

These cases, as I have already noticed, are not uncommon, and they show, what I always urge upon students, the absolute necessity, in all cases of lameness, of examining the foot. They also show the advantages, in all cases of injury of the foot, of freely opening up the seat of injury. In some cases I have found it necessary to pare away almost the whole crust. The same rule holds good in foul of the foot in cattle, and in foot-rot in sheep, where we can never expect to effect a cure until we have removed every portion of loose or detached horn, which acts as a foreign body by originating and keeping up irritation in the parts.

During the quarter, assistance was required in two cases of difficult parturition, both occurring on the 7th March. Not being able to attend personally, I requested two of the more advanced students to supply my place. In both cases they proved successful, saving the lives of both mother and calf. The first one was a breech presentation, the method adopted being that of pushing forward the hind-quarters, and bringing the hind-legs, one after the other, into the passage. The most noticeable fact in the second case was, that the cow had gone twenty days beyond her proper time. The students who attended this case reported on their return that they found the cow very weak, labour-pains regular, but by no means strong, and on examination the uterine passage almost closed. They administered a dose of stimulating medicine to support the mother, and with the fingers gradually dilated the passage. After persevering for a short time, they had the satisfaction to induce an increase of the labour-pains; the water-bag soon made its appearance, and a fine calf was ushered into the world. In both cases there were no untoward results.

In the two cases of *Purpura Hæmorrhagica* recorded, both followed bad attacks of influenza. This is a true blood disease, depending upon a deterioration in the quality of the circulating fluid, which is thin, and has lost its natural powers of coagulability. In

both cases we had the usual symptoms, which, however, were much more severe in one of them than in the other. In both we had swelling of the head and extremities, the skin being hot and painful, and the swellings soft and puffy. Pulse weak and quick, breathing in one case not much affected, in the other quickened; both animals were very weak. The lining membrane of the nose in both presented small purple spots or blotches, from which exuded a sort of thin bloody serum, which also escaped from some of the swellings in the worst case. In this latter the swelling of the head increased to such an extent as to threaten suffocation. In one case the animal rapidly recovered under the use of tonics and stimulants, good air, and plenty of nourishing and easily-digested food. The other proved more tedious; and in addition to stimulants and tonics, such as camphor, ale, and sulphate of iron, I found it necessary to scarify the swellings very freely, and keep hot-water fomentations constantly applied. In some cases of this disease, when sloughing is apt to supervene, mild astringents, such as a solution of acetate of zinc, will be found of great benefit. In addition, the strength of the animal must be kept up by good food, such as malt-mashes, and stimulants and tonics, the best of which is probably the tincture of muriate of iron.

Amongst the strains, &c. of tendons, was one worthy of notice—viz., the displacement of the tendon which passes over the point of the hock. From some accident which the owner could not explain, the tendon had slipped off the point of the heel-bone, and was found situated on the outer side of the hock. In such cases no treatment can be adopted, the only plan being to leave the case to nature, the tendon in course of time forming for itself a groove on the outer side of the bone. And although it may appear strange, yet still it is a fact that the horse is able to do its work, after a short period, in spite of such an injury. In some cases it may be necessary to sling the animal, and apply a smart blister to the part to keep it quiet.

The case of starvation recorded is one of a peculiar nature; it occurred in a hunter belonging to a party in the city. The horse was boxed at one of the Edinburgh railway stations for a station in the country, at which place it ought to have been delivered to a gentleman in the neighbourhood; but owing to some unaccountable negligence, either on the part of the company's servants or of the party to whom it was sent, the poor animal was kept confined in a railway horse-box for 114 hours without either food or water, or the possibility of its lying down. The horse, I presume, on reaching its destination, would be shunted in the box to a siding until called for, and had been there left in the state above mentioned. The way in which the culpable mistake was discovered, was, I believe, in consequence of the box being returned to Edinburgh as an empty one, when, on looking into it, the poor brute was found in a state more easily imagined than described. By the assistance of

several men it was taken down to Mr Moir's stables in Nottingham Place, where I was called in to see it. On my arrival, I found the pulse weak and quick, the animal scarcely able to stand, and straining fearfully; his back arched, belly tucked up, and eyes staring. I at once ordered him a stimulant, with hand-rubbing and warm clothing. After administering the stimulant in a little warm ale, he, after several efforts, succeeded in staling, which seemed to afford him great relief. The stimulants were continued for some days, with a good allowance, at the same time, of good sloppy food, administered in small quantities at a time, and repeated at frequent intervals. This plan of treatment was persevered in for a few days, after which he made rapid improvement, and by the end of the week he appeared as if nothing had been the matter, eating his food and able to take gentle exercise.

Amongst the cases of wounds recorded were several of a very severe nature. Two which proved fatal are worthy of notice, as showing the time an animal may linger with injuries of such an extensive and alarming character. The first case occurred in a cab-horse, on the evening of the 4th February, during the raging of the severe thunderstorm. On passing down Greenside Place, a peal of thunder so frightened a van-horse going in the opposite direction as to cause him to spring suddenly round. On doing so, the end of the van-shaft struck the chest of the cab-horse, penetrating it to the depth of about a foot. After getting the horse released, he was removed down to a stable in the neighbourhood, when I was sent for. On my arrival I found the animal sinking—his pulse so quick and hard as scarcely to be felt under the finger, his respirations so rapid as not to be counted. In this state he lived for several hours, eventually dying in intense agony. The next day a careful *post-mortem* examination was made, when the wound was found to enter the chest through the cartilages of the true ribs, passing through the diaphragm, and entering the abdomen, rupturing the colon or large gut, whose contents escaped partly into the abdominal and partly into the thoracic cavity. On its passage through the thorax, the shaft had grazed and slightly abraded the lung.—The second case occurred on the evening of the 11th of March, in a horse belonging to a gentleman in the neighbourhood. The accident was caused by the animal running away with the gig it was drawing, when the shaft was broken and penetrated the chest, entering the lungs. The horse was brought to one of the College Infirmary boxes, and on examination of the wound, I immediately prognosced—from the fracture of the ribs and depth of the internal wound—the case to be a fatal one. However, to my astonishment the animal lingered for nearly two days before succumbing. In this case, as in the preceding one, the pulse was scarcely to be felt, the symptoms somewhat resembling those of acute pleurisy. After death, a wound was found in the lungs to the depth of nearly two inches; the thoracic cavity

containing a quantity of clotted blood, with a considerable quantity of serous fluid, the whole lining membrane of the cavity being intensely inflamed.

Two other cases of wounds occurred in run-away horses, both of which, however, recovered. One was wounded in the shoulder, just in front of the arm ; the other grazed in the shoulder, with a large wound in the hip. The only treatment in these cases was to pin up the wounds, dress with cold water, and administer purgative medicine, with an injunction to give perfect rest. Although the wounds in both cases were excessive, yet in neither was any important organ injured, and the animals, both being in good health, rapidly recovered.

On the 20th of February a peculiar case of wounding was brought to the College yard. The man stated that that morning the pony, when feeding, had taken up with his hay a darning needle. He said that the pony had ceased eating suddenly, commenced to foam at the mouth, work his tongue from side to side, and appeared as if choking. On examining the mouth, he felt a piece of a needle sticking above his tongue, and, being frightened, brought him at once to the College. On his arrival, the tongue had swollen so much as to cover the offending agent. Ordering him to leave the animal, he was put into a sick-box, and a dose of laxative medicine given. The next day a swelling appeared between the jaws ; to this warm poultices were kept constantly applied. The animal appeared easier, and ate greedily of some gruel placed before him. On the 25th an abscess, which had formed between the jaws, was opened, and on exploration the sharp point of the needle was felt ; this was seized with a pair of forceps, and, with a little force, a darning needle 3 inches long was extracted. The wound was then dressed, and healed rapidly. On the 27th he was able to return to his work.

PROCEEDINGS IN THE LABORATORY.

By Thomas Anderson, M.D., F.R.S.E.

ON THE COMPOSITION OF THE POTATO PLANT AND THE EFFECT OF DIFFERENT MANURES IN THE AMOUNT AND QUALITY OF ITS PRODUCE.

Part I.

A science like agriculture requires to be built up by the careful aggregation of many minute facts, which can only be slowly and laboriously accumulated. It does not, like other branches of knowledge, give scope for great and brilliant discoveries, by which its boundaries are suddenly and widely expanded and new territories added to it, of which advantage may be taken to introduce important alterations or improvements in its practice. It is only by long-sustained and continuous efforts that it is possible for it to advance at all, and even then its steps are so small as to be individually almost imperceptible, although in the course of time they produce a distinct and unmistakable change. And not only are the steps by which it advances small, but its progress is still further retarded by the necessity of going over the same ground many times in succession; for the facts of agriculture, if deduced from a single observation, however accurately it may have been done, cannot be safely made the basis on which inferences may be founded, for they labour under the disadvantage of not being observed under invariable conditions. The proverbial uncertainty of the seasons, and a thousand other disturbing causes, are constantly at work, disappointing expectations, and modifying results ; and thus it happens that conclusions which appeared to be the legitimate and inevitable inferences of one set of experiments, are liable to be rudely overturned by the next, and that, not because the facts were erroneous, but because climate or soil had made these particular results exceptional.

To a certain extent this is true of every science, and it is always rash to reason from a single experiment; but in agriculture it is totally impossible to draw even the simplest inference without previously amassing a whole series of experiments ; and even then it may happen that some special point which could not be sooner detected may show itself and render it necessary to undo what had been done, and to reconstruct, perhaps many times in succession, the edifice which before appeared to be finally complete. All this is extremely disheartening, and it can scarcely be a matter of surprise that it should beget in some minds a feeling of impatience, and induce others to suppose that the study of agriculture as a science offers little advantages to the farmer, and that it is better to trust exclusively to the teachings of practice. A little farther consideration, however, tends to modify this opinion, and leads to a more just estimate of the relations of science and practice.

The history of the past shows us that the progress of practical agriculture always has been slow; and when science was called in to assist in its development, it was supposed that a rapid advance must be the consequence, and that the whole face of the country was to be speedily changed by it. These expectations, however, proved unfounded; and they did so, because they were based on an erroneous conception of the nature of science and the mode in which it obtains its facts. It has been looked upon as something antagonistic to practice, working in an entirely different manner, and having nothing in common with it; whereas, in point of fact, they follow an exactly similar method in the accumulation of their facts; and the tone and character of mind and kind of education which make a man a good farmer are exactly those which fit him for the study of science. It is by observation that the farmer acquires his experience; and it is by the exercise of that faculty that the scientific man extends his knowledge; and just in proportion as they observe well and carefully will be the value of their facts and the soundness of the conclusions they draw from them. But though their methods of observation are the same, they look at these facts from a different point of view; and it is in this respect especially that they are able to afford each other valuable assistance; and by combining the results of their experience, the one is enabled to clear up what appeared obscure to the other. Separate, they can do little—combined, they have the power to do much; and we may rest assured that the practice which ignores science acts as foolishly as the science which ignores practice. So long as each persists in adhering exclusively to its own point of view, and placing itself in antagonism to the other, no good can be done; and they are very much in the position of the two men, one of whom asserted that a particular shield was made of gold, while the other as obstinately insisted that it was silver; and it was only after much wrangling and discussion that they bethought them of the propriety of going together to examine it, when it turned out that one side was gold and the other silver.

It cannot certainly be justly alleged that agriculture has disregarded the teachings of science. On the contrary, it is beyond all question that the most distinguished practical farmers, the men who have done most for its practical improvement, and whose opinion is most respected by their brethren, have given in their firm adhesion to it, and recognised it as an additional lever placed in the hands of practice, which, rightly used, must assist its progress. But it must be as freely admitted that there are still many farmers who are unable to see any advantage which the practice of their art has derived from it, and who imagine that it may be safely neglected. Much of this may be attributed to the fact that many scientific improvements have been absorbed into practice, and the source from which they were derived has been forgotten; but still more is due to a

misconception which prevails, not only in agriculture, but in all the practical arts regarding the position of science in relation to them.

It seems to have been imagined that when chemistry was called in to the aid of the farmer it was to bring with it a full-fledged chemistry of agriculture, which might be immediately applied to practice, without any effort on his part. It was not sufficiently recognised that science, dealing with principles, uses them as a guide, by means of which it may build up a great branch of applied science; and that it cannot do this successfully when working alone, but requires the assistance of practice, which must not be content with stating what it requires, but must take an active part in working out experimentally the suggestions of science. In a word, there must be sacrifices on both sides, and much time and labour must be expended in laying foundations and accumulating facts, which may at the moment have so little effect as to appear almost unproductive, although they are destined at some future time to weave in with others as yet unknown, but of whose discovery they are the indispensable precursors. The course of events when practice applies to science (and this is just as true in regard to any art as it is with agriculture) is generally this: Practice makes certain observations of which it seeks an explanation, and when science takes up the question, it very probably finds that the facts required to enable it to give that explanation do not exist, and must be obtained at the expense of much labour; possibly also it may be found that there are some points required which can be supplied by practical observations only, and thus, before what is perhaps a very simple matter can be explained, both science and practice must be set in motion, and made to accumulate a whole store of facts.

None but those who have been compelled to turn their attention to the matter can have the least conception of the small number of facts, of a character sufficiently definite to admit of their being made a satisfactory basis for scientific reasoning, which agriculture offers. Nor can they be convinced of the difficulty of supplying them until they have tried to do it, and have suffered from the failures and disappointments inseparable from even the most carefully performed experiments, and against which no foresight can provide. Circumstances may arise which destroy an experiment when it is half finished; or, what is still worse, which render its results fallacious, without affording the means of detecting the fallacy. Hence it is that a solitary experiment cannot be relied on, and repeated trials are necessary to render results conclusive; and hence also the necessity for repeating experiments many times in succession, and expending upon them an amount of minute care, the importance of which has only been recognised within a few years. The same observations apply, though perhaps less forcibly, to the more purely scientific departments of agriculture; and it may be safely asserted that, both in the field and the laboratory, the labour of many years must be

devoted to the accumulation of materials for the foundations alone, and the importance of much of which will only become apparent in future years.

I have been led into these observations when considering the nature of the researches which form the subject of this paper, and they are exactly of the kind which illustrate the amount of labour which must be expended on the determination of facts, some of which may, at first-sight, appear somewhat remote from practical applications, although, on more minute examination, they will be seen to teach many important bearings upon it. They may be considered as an extension of a department of agricultural chemistry which was entirely untouched when I took it up some years since, but which is of much importance in giving us a definite idea of the progress of growth of different crops, and leads to valuable inferences as to the mode of manuring, and many other practical questions. I have already examined in this way turnips and wheat grown in the same soil, and intended to have prosecuted the inquiry through the entire rotation; but circumstances having rendered it advisable to break through the rotation and lay the land down in permanent pasture, I have been deprived of the opportunity of doing so.

The subject, however, of the composition and mode of growth of different plants is one of such interest that it did not appear at all advisable to abandon it entirely, the more especially as the experience I had gained in the previous years had taught me the most convenient and effectual means of carrying out such experiments. On thinking the matter over, it appeared to me that the potato was well suited for such inquiries, both on account of its importance, and from its having been less minutely examined by chemists than most other crops. I thought also, that by some modification of the system of experiment, the results might be brought into more intimate connection with practice, and thus data, which might interest a larger number of persons than a purely scientific treatment of the subject, be obtained. On laying my views before the Chemical Committee of the Society, they were most cordially supported by the practical members, and to their assistance and advice, much of the practical value of the experiments which follow is due.

On considering the question in detail, it appeared that the subjects which it was desirable to investigate were—1st, The composition of different varieties of potato; 2d, The progress of their growth, and composition of the plant at different stages of its existence; 3d, The influence of different soils; 4th, The effect of different manures. To the farmer acquainted with the difficulties of field experiments, and to the chemist who knows the amount of time and labour which must be expended on minute analysis, it will be obvious that an exhaustive examination of a subject like this must be the work not of one but of many years. The first object, therefore, was to fix limits to the inquiry, and to reduce it within such

bounds as it was possible to manage, and it was resolved to go upon the principle of undertaking no more than could be effectually accomplished.

In the first place, six of the varieties of potato in most extensive cultivation were selected for experiment, and those chosen were Regents, Dalmahoys, White-rocks, Flukes, Skerry-blues, and Orkney-reds.

As regards soil, it was thought sufficient to select a heavy clay soil, a light sandy soil, and newly reclaimed moss land, on which astonishing crops of potatoes are obtained; application was therefore made to Mr Gibson, Woolmet, to undertake the experiments on a clay soil, to Mr Guthrie, Crossburn, Troon, for the light soil, and Mr Maxwell undertook to provide for the moss land, at Dargavel. In addition to these gentlemen, Mr Scott Skirving, Camptoun, Drem, undertook a similar series of experiments on his own farm. It is unnecessary for me to say that the names of these gentlemen are a sufficient guarantee for the accuracy with which their part of the work was done, and I must here express the debt of gratitude I owe them for the trouble which they have taken.

It was much more difficult to come to a satisfactory conclusion as to the kind and quantity of the manures to be used, because it was obvious that the substances which might be depended upon to produce a good result on a rich and heavy soil might be very unsuitable to moss or light land. This, of course, is a difficulty to which all comparative experiments on different kinds of soils are, to a certain extent, exposed, and is indeed inseparable from all agricultural experiments. It is obvious, in fact, that if we adopt, as the standard, a system of manuring more especially adapted to one particular description of soil, and make experiments exactly similar in all respects on another, whose capabilities are best brought out in a different treatment, the latter is placed at a certain disadvantage. If the sole object with which the experiments are undertaken is to determine the system of management best fitted to develop the resources of the soil in question, this would clearly be the proper course to adopt. But this was only one of the points it was proposed to bring out in the present series of experiments. One object, among others, was to ascertain which of the six varieties of potatoes selected yielded the most productive crop as regards both quantity and quality; and, to obtain results of any value on this point, it was obviously necessary that the crop on each soil should be brought to a state of full perfection, which could not be done by using exactly the same manures in the same quantities, but by taking those which experience had shown to be most suitable to each district and soil. In growing the different varieties of potatoes, each experimenter was therefore requested to manure the land in exactly the manner which he considered best, that is to say, according to the system he always employed, and accordingly the six kinds were grown as part of the

crop in a field laboured and manured in the ordinary manner employed for the rest of it. It will be seen afterwards that this has given rise to great differences, one experimenter, Mr Gibson, having raised his crop entirely with artificial manures, while in the other cases, the principal part of the application consisted of farmyard manure.

In that part of the experiments in which different manures were contrasted with one another, it was felt to be most essentially important to restrict them within the narrowest possible limits, as it was only in this way that it was practicable to overtake the large number of analyses I contemplated. After careful consideration, it was resolved to restrict them to farmyard manure, and one application of artificial manures, and that these should be applied to two kinds only—namely, Dalmahoys and Regents. The quantities of manures were—

1. 25 tons farmyard manure per acre.
2. 35 ,, ,, ,,
3. 3 cwt. Peruvian guano, and 5 cwt. Lawes' superphosphate.

These quantities may possibly be considered excessive, and they are no doubt above the average, but they were fixed with the advice of practical farmers, and partly with the view of ascertaining the effects of large applications of manure, on which subject they will be found to throw some light. It is worthy of notice that, however large they may appear, they actually fell short in one case of the quantity used in the ordinary course in the same field.

It would have been most interesting, had it been possible, to have extended the experiments to the effects of different artificial manures, such as sulphate of ammonia, nitrate of soda, guano, and superphosphate, and more particularly to the salts of potash, which in some soils and seasons have been found to exert an astonishing influence on the potato, but it was thought better to avoid this in the meantime. Mr Gibson, however, has supplied a series of very interesting trials of this kind.

As soon as the arrangements had been made for the experiments, I commenced a series of preliminary inquiries, for the purpose of determining the best mode in which the analyses might be conducted. On this subject little information is in existence, and hitherto the analyses of vegetable products have been restricted within very narrow limits, and have been confined to ascertaining the amount of albuminous compounds, respiratory principles, oil, ash, and water, while in some cases the quantity of fibre has been determined. Such an analysis divides the constituents into several great families of proximate principles, but does not attempt to distinguish between the different members of each family. Sugar and starch, for instance, are massed together as respiratory substances, and no distinction is made between different albuminous compounds.

although there are several substances of the class well-known to chemists. The reason for this is, that the separation of these substances from one another is often excessively difficult, and no means of effecting it in a sharp manner have yet been discovered, except by methods so tedious and uncertain, that they cannot be practised with satisfaction. A system of analysis, to be of any use in such experiments as I proposed to make, must be rapid, and admit of being made many times in succession; while all the methods hitherto devised for determining the proximate principles of plants have been tedious, difficult, and unsatisfactory, so much so, that chemists have been deterred from prosecuting the subject to the extent its importance requires.

In entering upon such a series of experiments as those now about to be detailed, it seemed important that some attempt should be made to devise a more precise kind of experiment. I accordingly, in the autumn of 1861, obtained, through the kindness of Mr Melvin, Bonnington, Ratho, specimens of sound and diseased potatoes of that year's crop, which were subjected to a pretty extensive series of experiments, for the purpose of devising an improved process of analysis. I cannot say that the result was encouraging, for it tended to show that, in the present state of our knowledge, the simpler methods are the most trustworthy, although by proper management a larger amount of information may be obtained than is given by the ordinary analyses of feeding substances. To the experiments in question, though occupying much time, it is not necessary for me to advert in detail, although I may have occasion to refer to them afterwards. It will be enough to say, that they enabled me to fix upon the plan of analysis to be adopted in the next season, which I shall now explain.

When the potatoes were received at the laboratory, a certain number, generally 8 or 10, were selected, so as to give a fair average of the whole, including both large and small. These were cut in half, and a slice taken from each, weighed, and exposed in the water-bath until their weight became constant, for which four or five days were required, after which they were burned, to give the percentage of ash.

Another portion of the same potatoes was grated down to a pulp, and introduced into a small bag of fine calico, in which it was kneaded under water with a very gentle pressure, until the starch had completely passed through. The starch was collected on a weighed filter, washed, dried, and weighed. The residue on the cloth was dried and weighed. It was a mixture of fibre and insoluble albuminous compounds, and the proportion of the latter, ascertained by determining the nitrogen—the albuminous compounds corresponding to which being deducted—left *fibre*.

The remainder of the potatoes were dried at a low temperature, and one portion used for the determination of the total albuminous

compounds, and another was exhausted with strong alcohol, and the fluid evaporated gave sugar. The results obtained in this process, which is extremely tedious and troublesome, were such as to induce me to omit it in a considerable number of the analyses, and to estimate the sugar by difference.

The rest of the potatoes were burned for ash.

These chemical details will not be interesting to the farmer, but I have thought it necessary to put them on record to show the processes employed, and for the guidance of future experimenters.

COMPOSITION OF THE MANURES EMPLOYED.

The artificial manures used in the experiments were obtained from one stock, and were carefully mixed and sent to the different experimenters, samples being kept for analysis. Their composition was as follows:—

Peruvian Guano.

Water,	16.40
Organic matters and ammoniacal salts,	53.83
Phosphates,	20.48
Alkaline salts,	8.12
Sand,	1.17
	100.00
Ammonia,	17.96
Phosphoric acid in the alkaline salts, equal to 6.52 phosphate of lime,	3.01
Phosphoric acid in the phosphates,	9.45

Superphosphate.

Water,	12.41
Organic matters and water of combination,	13.46
Biphosphate of lime, equal to 21.16 soluble phosphates,	13.57
Insoluble phosphates,	12.25
Sulphate of lime,	41.56
Alkaline salts,	1.48
Sand,	5.27
	100.00
Ammonia,	0.61
Phosphoric acid in the soluble phosphates,	9.76
,, ,, insoluble ,,	5.55

It is, of course, as sources of phosphoric acid and ammonia that these manures are chiefly valuable, and it is easy to calculate, from their composition, the exact amount of these substances which they supply to the crop. To facilitate these calculations, I give the number of pounds of each substance contained in 1 cwt. of the manure, to which I have added the potash of the guano, although its quantity is unimportant.

	Peruvian Guano.	Superphosphate.
Phosphoric acid in the soluble form,	3.36	10.93
,, ,, insoluble ,,	10.58	6.32
Ammonia,	20.11	0.68
Potash,	1.20	,,

Hence, as 3 cwt. of guano and 5 cwt. of superphosphate were used to the acre, the application contained—

Phosphoric acid in the soluble form, . .	64.73 lb.
" " insoluble " . .	63.19 "
Ammonia, ...	63.73 "
Potash, ...	3.60 "

My first idea was to analyse also the different farmyard manures used, but I was led to abandon that intention by the difficulty there is in obtaining a fair average sample of so bulky and heterogeneous a substance, and I came to the conclusion that a better and safer result would be obtained by taking an average analysis deduced from those already published. In doing this, I have chiefly relied on the analyses made by Dr Voelcker some years since, both because they are the most complete, and distinguish between the substances soluble and insoluble in water. I adopt, as the average percentage of valuable substances in farmyard manure, the following numbers, to which is added the number of pounds of each ingredient per ton.

	Per cent.	Lb. per ton.
Phosphoric acid in the soluble form, .	0.130	2.90
" " insoluble " .	0.190	4.25
Ammonia in the soluble form, . .	0.250	5.60
" insoluble " . .	0.590	13.21
Potash, ...	0.550	12.32

The quantities of farmyard manure employed in the experiments, being respectively 25 and 35 tons, it follows that the valuable substances contained in these quantities in pounds are—

	25 tons.	35 tons.
Phosphoric acid in the soluble form, .	72.50	101.50
" insoluble " .	106.25	148.75
Ammonia in the soluble form, . .	140.00	196.00
" insoluble " . .	330.25	462.35
Potash, ...	308.00	431.20
Total phosphoric acid, . . .	178.75	250.25
Total ammonia, ...	470.25	658.35

The most remarkable point here is the much larger quantity of the valuable matters contained in these applications of farmyard manure than in the artificial manures applied, although the latter were used in far from sparing quantity. The total ammonia in the 25 tons is nearly 7 times, and in the 35 tons just 10 times as large as in the mixture of guano and superphosphate; and even if we exclude the insoluble ammonia, and assume that it is not immediately available, the difference is still very great. But more remarkable still is the difference in potash, which is even, in the smaller quantity of farmyard manure, just 100 times as abundant as in the artificial mixture, nor must it be supposed that this estimate exaggerates the quantity of these substances, for they are taken from the average of good analyses, and even if we selected the *minimum* quantity found, the difference would still be enormous. It is not necessary to advert here to the other constituents of these manures, further than to direct

attention to the remarkable contrast in the amount of organic matters, which in the artificial manures does not exceed a couple of hundredweight, while, in round numbers, it is 5 and 7 tons in the two quantities of farmyard manure.

COMPOSITION OF THE SEED POTATOES.

The potatoes used for seed were of the best quality which could be obtained, and were all taken from the same stock, and divided among the experimenters, samples being also sent to myself. They were submitted to analysis in the way already described, and complete analyses of the ash made in each case. The results are here given, and will be afterwards contrasted with those obtained from the crop they yielded.

Regents.

The seed of this variety was of remarkably good quality, and consisted entirely of large and well formed tubers, well grown, and carefully selected, none of them showed the slightest trace of disease.

Water,	76.32
Starch,	12.21
Sugar, &c.,	2.75
Soluble albuminous compounds,	2.16
Insoluble,	0.21
Fibre,	5.53
Ash,	0.88
	100.06
Nitrogen,	0.379

The ash contained—

Peroxide of iron,	0.31
Lime,	1.79
Magnesia,	5.75
Potash,	50.52
Chloride of potassium,	5.39
Chloride of sodium,	2.07
Phosphoric acid,	11.49
Sulphuric acid,	7.08
Silicic acid,	0.98
Carbonic acid,	11.30
Charcoal,	3.65
	100.33

And the same, calculated after deduction of carbonic acid and charcoal, gave—

Peroxide of iron,	0.36
Lime,	2.09
Magnesia,	6.73
Potash,	59.17
Chloride of potassium,	6.33
Chloride of sodium,	2.44
Phosphoric acid,	13.45
Sulphuric acid,	8.29
Silicic acid,	1.14
	100.00

Dalmahoys.

The tubers of this sample were much more variable in size than those of the last, and thence in making the analysis care was taken to select both large and small for the purpose. The quality was good, and there was no disease. The analysis gave—

Water,	75.91
Starch,	12.58
Sugar, &c.,	2.93
Soluble albuminous compounds,	2.10
Insoluble albuminous compounds,	0.15
Fibre,	5.21
Ash,	0.81
	99.69
Nitrogen,	0.360

The ash contained—

Peroxide of iron,	.35
Lime,	2.04
Magnesia,	4.56
Potash,	49.62
Chloride of potassium,	6.58
Chloride of sodium,	2.93
Phosphoric acid,	11.21
Sulphuric acid,	6.57
Silicic acid,	1.25
Carbonic acid,	10.26
Charcoal,	4.52
	99.99

Recalculated, after deduction of carbonic acid and charcoal—

Peroxide of iron,	.41
Lime,	2.39
Magnesia,	5.36
Potash,	58.30
Chloride of potassium,	7.74
Chloride of sodium,	3.44
Phosphoric acid,	13.17
Sulphuric acid,	7.73
Silicic acid,	1.46
	100.00

Skerry-blues.

This variety is distinguished by its dark purple or blue colour. The sample was good, but slight traces of disease were observed in one or two of the tubers used for analysis—

Water,	76.60
Starch,	11.79
Sugar, &c.,	3.09
Soluble albuminous compounds,	1.90
Insoluble albuminous compounds,	0.16
Fibre,	5.41
Ash,	0.94
	99.89
Nitrogen,	0.320

The ash contained—

Peroxide of iron,	.85
Lime,	1.50
Magnesia,	6.16
Potash,	45.87
Chloride of potassium,	9.32
Chloride of sodium,	2.24
Phosphoric acid,	10.47
Sulphuric acid,	5.63
Silicic acid,	2.93
Carbonic acid,	10.02
Charcoal,	3.93
	98.92

Carbonic acid and charcoal being deducted, this gave—

Peroxide of iron,	1.85
Lime,	1.76
Magnesia,	7.24
Potash,	53.98
Chloride of potassium,	10.96
Chloride of sodium,	2.62
Phosphoric acid,	12.32
Sulphuric acid,	6.62
Silicic acid,	3.49
	100.00

White-rocks.

This was an excellent sample—the tubers large and well formed, and quite free from disease—

Water,	75.93
Starch,	12.77
Sugar, &c.,	2.17
Soluble albuminous compounds,	1.88
Insoluble albuminous compounds,	0.24
Fibre,	5.55
Ash,	1.04
	99.58
Nitrogen,	0.321

One hundred parts of ash gave—

Peroxide of iron,	0.10
Lime,	1.68
Magnesia,	3.87
Potash,	48.33
Chloride of potassium,	10.80
Chloride of sodium,	2.76
Phosphoric acid,	11.18
Sulphuric acid,	7.39
Silicic acid,	0.80
Carbonic acid,	9.46
Charcoal,	3.73
	99.50

After deduction of carbonic acid and charcoal, these numbers stand thus—

Peroxide of iron,	0.11
Lime,	1.94
Magnesia,	4.47
Potash,	55.98
Chloride of potassium,	12.51
Chloride of sodium,	2.59
Phosphoric acid,	12.95
Sulphuric acid,	8.55
Silicic acid,	0.90
	100.00

Orkney-reds.

An excellent sample of this variety, the tubers being large and perfectly free from the slightest trace of disease.

Water,	78.57
Starch,	10.85
Sugar, &c.,	2.78
Soluble albuminous compounds,	1.48
Insoluble,	0.21
Fibre,	5.92
Ash,	0.98
	100.80
Nitrogen,	0.270

The ash contained—

Peroxide of iron,	0.29
Lime,	1.14
Magnesia,	4.75
Potash,	50.76
Chloride of potassium,	11.20
Chloride of sodium,	3.02
Phosphoric acid,	7.75
Sulphuric acid,	3.96
Silicic acid,	0.68
Carbonic acid,	13.86
Charcoal,	3.06
	100.47

After deducting carbonic acid and charcoal, this gives—

Peroxide of iron,	0.35
Lime,	1.38
Magnesia,	5.68
Potash,	61.72
Chloride of potassium,	13.54
Chloride of sodium,	3.57
Phosphoric acid,	9.24
Sulphuric acid,	4.77
Silicic acid,	0.75
	100.00

Flukes.

This variety is distinguished by its long kidney shape, and by the small number of eyes on each tuber. This peculiarity renders it necessary to set them whole, and as this was not known in two of the sets of experiments, the crop proved a complete failure.

Water,	74.41
Starch,	12.55
Sugar, &c.,	2.89
Soluble albuminous compounds,	1.98
Insoluble,	0.20
Fibre,	6.71
Ash,	0.98
	100.00
Nitrogen,	0.348

The ash contained—

Peroxide of iron,	0.39
Lime,	1.17
Magnesia,	4.61
Potash,	53.73
Chloride of potassium,	4.48
Chloride of sodium,	2.14
Phosphoric acid,	12.84
Sulphuric acid,	5.67
Silicic acid,	1.15
Carbonic acid,	11.65
Charcoal,	2.75
	100.58

Which gives, after deduction of carbonic acid and charcoal—

Peroxide of iron,	.45
Lime,	1.35
Magnesia,	5.34
Potash,	62.38
Chloride of potassium,	5.19
Chloride of sodium,	2.49
Phosphoric acid,	14.89
Sulphuric acid,	6.58
Silicic acid,	1.33

In examining these results, we are struck by the general resemblance in the composition of the different samples, the extreme difference in the percentage of water, amounting to no more than four per cent. This may be partly due to their having been preserved during the winter, under precisely similar circumstances, for larger differences were found in the crops obtained from them, which, of course, were analysed as soon as they were taken out of the ground. Of the organic constituents, the largest and most important is starch, and here also the difference is small, and scarcely exceeds two per cent. The difference in the composition of the dry matter, however, is larger, as is seen from the subjoined statement of the quantities of starch in the dry residue of each kind of potato.

Regents,	50.6
Dalmahoys,	52.9
Skerry-blues,	51.5
White-rocks,	53.9
Orkney-reds,	48.8
Flukes,	49.7

The other constituents show little variation, and the albuminous compounds, in all six varieties, may be said to be practically identical in quantity.

The mineral matters also show comparatively little variation, except in the quantity of potash, as may be seen from the following table, giving the percentages of that element and of phosphoric acid.

	Potash.	Phosphoric Acid.
Regents, ...	62.92	13.45
Dalmahoys, . . .	62.88	13.17
Skerry-blues, . . .	60.35	12.32
White-rocks, . . .	62.72	12.95
Orkney-reds, . . .	69.21	9.24
Flukes, ...	66.51	14.89

The whole of these potatoes are remarkable for the large quantity of potash, and small amount of soda contained in their ash, and in this respect they differ considerably from previous analyses, most of which show a very considerable percentage of soda, chiefly in the state of chloride of sodium. The quantity of phosphoric acid is remarkably similar in all the varieties, except in the Orkney-reds, in which it falls just three per cent below any of the others. It is interesting to notice that, in all the samples these two constituents form almost exactly three-fourths of the entire ash. Next to these the most abundant substance is magnesia, which amounts in the Regents and Skerry-blues, to about 7 per cent of the ash.

RESULTS OF THE FIELD EXPERIMENTS.

I.—*Experiments made at Woolmet, Mid-Lothian, by Mr Gibson.*

In addition to the experiments with seed supplied by the Highland Society, and in the manner already specified, Mr Gibson made another series with the seed which he usually cultivates, and with a variety of different artificial manures. Experiments in 2 to 15 inclusive are those with the seed supplied, the remainder are those with Mr Gibson's own seed.

The field in which the potatoes were planted was perfectly level, and very uniform in quality of soil. They were planted after trench-ploughed three-year-old pasture, on which, during winter and spring, the sheep-stock had been fed with turnip, cabbage, and oil-cake. The crop had a most luxuriant appearance all the season. The potatoes were planted on the 18th and 19th of April, and lifted on the 21st October 1862.—(*See* TABLE, page 53.)

These experiments offer many points of interest, for they show, what many farmers are inclined to doubt, that it is possible to produce a large crop of potatoes by means of artificial manures alone. Here it happens that in some cases, though not in all, the farmyard manure gives a lower produce than the artificial mixtures. These results are, no doubt, due to the soil having been in high condition, and enriched by the previous treatment, for the feeding sheep on it during the preceding season amounted to a liberal manuring; and the proof of this is to be found in the fact that, even where no manure was applied, the produce was large, and would, in many parts of the country, be considered a fair crop. It is probable

TABLE I.—EXPERIMENTS MADE AT WOOLMET, MIDLOTHIAN.

		Sound, per Imp. acre.	Diseased, per Imp. acre.	Small, per Imp. acre.	Total Produce, Sound, Diseased, and Small, per Imp. acre.
		Ton. cwt. lb.	Ton. cwt. lb.	Ton. cwt. lb.	Ton. cwt. lb.
1	Own Regent, got no manure or artificial, ...	6 2 38	3 15 70	0 1 13	9 19 9
2	White-rocks, got 3 cwt. guano, 1½ cwt. Lawes', and ½ cwt. Hill's superphosphate, per acre, ...	8 6 92	2 5 67	0 13 39	11 5 86
3	Fluke Potatoes, do. do. do.	5 4 60½	3 0 6	0 6 75	8 11 29½
4	Orkney-red, do. do. do.	9 9 7	0 6 75	1 7 90	11 3 60
5	Skerry-blues, do. do. do.	9 7 106½	0 1 11½	1 8 102	10 17 108
6	Dalmahoy, do. do. do.	6 11 26	4 14 59½	0 2 25	11 7 110½
7	Regent, do. do. do.	4 11 22	4 11 22	0 2 25	9 4 69
8	Dalmahoy, got no manure or artificial, ...	6 16 62	2 9 29½	0 3 51	9 9 30½
9	Do. got guano, 3 cwt., and Lawes' superphosphate, 5 cwt. per acre,	6 13 11	4 4 78	0 6 102	11 4 79
10	Do. got 25 tons well made manure, per acre, . . .	6 12 26	3 3 107	0 0 0	9 16 21
11	Do. got 35 tons do. do.	6 1 97	3 17 88	0 7 87	10 7 48
12	Regents, got no manure or artificial, ...	4 7 33	2 15 35	0 3 51	7 6 7
13	Do. got 3 cwt. guano, and 5 cwt. Lawes' superphosphate, per acre,	5 10 70	3 7 46	0 5 20	9 3 24
14	Do. got 25 tons well made manure, per acre, . . .	4 2 109	3 16 103	0 4 36	8 4 24
15	Do. got 25 tons do. do. . . .	4 1 27	3 9 16	0 3 51	7 13 94
16	Own Regents, got no manure or artificial, ...	6 18 32	1 14 64	0 3 51	8 16 35
17	Do. got 3 cwt. guano, and 5 cwt. Lawes' superphosphate, per acre,	8 4 24	3 2 25	0 3 51	11 9 100
18	Do. got 25 tons well made manure, per acre, . . .	6 18 32	4 6 48	0 3 51	11 8 19
19	Do. got 35 tons do. do. . . .	7 2 68	4 7 32	0 3 51	11 13 39
20	Do. got no manure or artificial, ...	7 5 22	2 5 90	0 4 36	9 15 36
21	Do. got Lawes' superphosphate, 8 cwt. per acre, . .	7 9 58	3 2 25	0 4 36	10 16 7
22	Do. got Hill's do. 8 cwt. per acre, . .	7 15 64	2 11 96	0 3 51	10 10 99
23	Do. got guano, 6 cwt., per acre, ...	7 16 49	3 6 61	0 3 51	11 6 49
24	Do. got no manure or artificial, ...	7 8 73½	2 13 65	0 2 66	10 4 92½
25	Do. got a mixture of ⅓d guano, ⅔ds Lawes' superphosphate, and 8 cwt. per acre, ...	8 0 85	3 18 58	0 4 36	12 3 67
26	Own Dalmahoy got do. do. do. and 12 cwt. per acre,	6 4 62	0 18 101	0 17 89	8 1 28
27	Do. got Lawes' supersphosphate, 12 cwt. per acre, . .	5 3 7	1 0 2	0 10 1	6 13 50
28	Do. got Hill's do. 12 cwt. per acre, . .	5 6 85	1 2 27	0 10 1	6 19 1
29	Do. seed steeped in solution of Bluestone, and same artificial as No. 2, ...	5 13 49	1 6 77	0 6 75	7 6 89

also that the marked effect of the artificial manures may be explained in a similar manner; and it may be supposed that the soil had been, so to speak, saturated with the dung of the sheep—a manure similar in its nature to farmyard manure—and hence, when in the next season a quantity of the latter was used, its influence was comparatively small, while the artificial manures brought out the effect of the substances lying in the soil, and which, under a different treatment, lay dormant, and would only have become available for future crops.

The difficulties which beset all field experiments are also well illustrated, for Mr Gibson, having left no less than four unmanured plots of his own Regents, we are enabled to see to how great an extent the crop varies, even in a field which is remarkably uniform in soil. The four experiments gave—

	Tons.	cwt.	lb.
No. 16	8	16	35
" 20	9	15	36
" 1	9	19	9
" 24	10	4	92½
Average, ...	9	13	99

Here the difference between the highest and the lowest results amounts to 1 ton 8 cwt. 54 lb., or nearly 18 per cent of the produce, but the other two come very close to the average. Still more remarkable is the effect in regard to the other Regents; for here we find the unmanured plot giving only 7 tons 6 cwt. 7 lb., or 1 ton 10 cwt. 28 lb. below the lowest, and 2 tons 18 cwt. 85 lb. less than the highest in the other lot, a difference which is very remarkable. In no case, indeed, does the produce of these Regents, even when manured, come up to that of the unmanured plots from Mr Gibson's own seed, and, singularly enough, that which got 35 tons of manure is only 6 cwt. in excess of that which got no application at all. This may be due either to the superiority of Mr Gibson's seed, or to inferiority of the soil on that part of the field. It is scarcely probable, however, that the former of these causes should have much effect, for both kinds of seed appeared of excellent quality, and even, making every allowance for possible variations, it must be pronounced to be very unlikely that two crops of the same variety, grown on similar soils, and similarly treated, should differ so greatly as these did. We are, therefore, led to attribute part, and probably the larger part, of the difference to some inferiority of the soil at this part of the field; and this view derives support from the fact that all the cases of small produce are in plots immediately adjoining one another. The numbers attached to the different experiments give the order in which they stood in the field, and it will be noticed that the smallest produce from the unmanured plot of Mr Gibson's own regents, No. 16, adjoins plots 12 to 15, on which the other kind were grown.

On comparing the effects of the different manures, the point which most immediately attracts attention, is, that the produce is

by no means proportionate to their quantity. Stating the matter generally, it may, in fact, be said that the artificial manures gave a larger increase than the 25 tons of farmyard manure, and that surpassed the 35 tons. Thus giving the apparently paradoxical result of obtaining the largest produce from the smallest amount of valuable matters. The explanation, however, is not difficult, and is to be found in the condition of the soil itself, which had been so much enriched by the liberal treatment it had received during the previous seasons that the quantity of farmyard manure applied to it constituted a clear case of over-manuring.

The effect of the large quantity of manure is seen in another way by the increase it produces in the proportion of diseased tubers. All the plots in this case presented a considerable amount of disease, but it is always largest where much manure has been used. This is clearly seen by the following table, giving the weight of diseased potatoes in the different plots of regents, which have been selected on account of the number of experiments admitting of an average being given.

TABLE GIVING THE WEIGHT OF DISEASED REGENTS, UNMANURED, AND WITH ARTIFICIAL AND FARMYARD MANURE.

No.	No Manure.			No.	Artificial Manures.			No.	Farmyard Manure.		
	Tons.	cwt.	lb.		Tons.	cwt.	lb.		Tons.	cwt.	lb.
1	3	15	70	7	4	11	22	14	3	16	103
12	2	15	35	13	3	7	46	15	3	9	16
16	1	14	64	17	3	2	25	18	4	6	48
20	2	5	90	21	3	2	25	19	4	7	32
24	2	13	65	22	2	11	96				
				23	3	6	61				
				24	3	18	58				
Average,	2	13	109		3	9	111		3	19	106

The plots manured with farmyard manure thus giving, on the average, 1 ton 5 cwt. 109 lbs. more of diseased tubers than the unmanured portions. This, however, does not hold good with the Dalmahoys, which are most highly diseased where no manure has been used.

Of the different varieties of potatoes, the Fluke gives the smallest, and the Dalmahoy the largest, amount of produce. Mr Gibson's own Dalmahoys, however, yield a very small return; but it will be noticed that they were all grown with an excessively large quantity of artificial manure, and therefore cannot be fairly compared with the others, and only confirm what has been already said regarding the injurious effect of a very large application.

II. *Experiments made at Crossburn, Troon, Ayrshire, by Mr Guthrie.*

These experiments were made on a light and rather sandy soil of very uniform texture, situated about a mile from the sea, and which

had gone through the ordinary rotation. The potatoes were planted on the 9th April; but, owing to the extremely unfavourable weather previous to that time, the ground was not in a satisfactory state. During the whole season the weather was extremely wet and cold, and the crop, as was the case over all the western districts of Scotland, was much under the average, although there was very little disease. The general crop received 15 tons farmyard manure, and 2 cwt. of superphosphate, and with this the White-rocks, Flukes, Skerry-blues, and Orkney-reds were manured. Mr Guthrie, however, unfortunately omitted to make the same experiment with the Regents and Dalmahoys; but these varieties received the different quantities of dung and artificial manures which were used in the other experiments.

TABLE II.—EXPERIMENTS MADE BY MR GUTHRIE, CROSSBURN, TROON.

No.		Good.			Diseased.			Total.		
		Tons.	cwt.	lb.	Tons.	cwt.	lb.	Tons.	cwt.	lb.
1	White-rocks, 65 tons dung, 2½ cwt. superphosphate,	6	9	48	0	2	36	6	11	85
2	Flukes, ...	3	5	49	0	3	61	3	8	110
3	Skerry-blues, ...	6	6	48	0	1	12	6	7	60
4	Orkney-reds, ...	6	1	85	0	1	49	6	3	22
5	Regents, no manure, . .	2	15	37	0	7	85	3	3	10
6	Do. 3 cwt. Peruvian guano, and 2½ cwt. Lawes' superphosphate, ...	4	11	54	0	9	72	5	1	14
7	Do. 25 tons farmyard manure,	4	8	5	0	9	72	4	17	77
8	Do. 35 tons do. . .	3	18	32	0	9	96	4	8	16
9	Dalmahoys, no manure, . .	3	7	59	0	7	23	3	14	82
10	Do. 3 cwt. Peruvian guano, and 2½ cwt. Lawes',.	5	0	89	0	9	72	5	10	49
11	Do. 25 tons farmyard manure,	4	12	41	0	14	9	5	6	50
12	Do. 35 tons do.	4	5	55	0	14	59	5	0	2

In comparing these with the Woolmet experiments, the point which most immediately attracts attention is the much smaller amount of produce in every case; and this is no doubt mainly due to the weather, which, though cold in Mid-Lothian, was not unfavourable to the potatoes; while in Ayrshire, the continued wet, accompanied by a low range of the thermometer, acted most injuriously on the crop throughout the whole county, which was greatly under the average. Some effect may also, no doubt, be attributed to the difference of soil, and there are distinct indications that the crop has been more dependent on the manure supplied to it than in Mr Gibson's experiments. In the latter, the increase of the produce from the manured plots over that of the unmanured does not exceed 10 or 15 per cent; while in Mr Guthrie's it ranges from 30 to 40 per cent, and even higher in one case. It is interesting to notice that the direction of the differences is the same as in the former series, and that the largest applications of manures are far from producing the most favourable results. On the contrary, just as at Woolmet,

the small application of artificial manures stands highest—25 tons of farmyard manure is lower, and 35 tons the lowest, of the three. A larger quantity of manure also increases, though not to any great extent, the amount of disease. It adds but little to it in the Regents, but nearly doubles it in the Dalmahoys. In no case, however, is the proportion of diseased bulbs so large as at Woolmet, where the soil appears to be charged with manure. As regards the different varieties, the Fluke again gives the smallest produce, and White-rocks the largest; but, owing to the omission already mentioned, we cannot compare them with Regents and Dalmahoys manured in the same way—although, to judge from the other experiments, we might infer that they would hold an intermediate place.

III.—*Experiments made at Dargavel.*

These experiments were made on the newly-reclaimed moss which had not previously borne a crop of any kind. The moss is first deeply trenched, and open drains formed in it, which are left open for at least a year, and, if possible, for twice that period. When the moss has consolidated, tiles on wooden soles are laid, and the whole receives an application of lime, without which no crop can be obtained. The experiments were made on a field under potatoes, and the general crop received no less than 35 tons of farmyard manure, and 2½ cwt. of superphosphate. The other experiments were made in the same way as the preceding series, except that three different proportions of artificial manures were used. It is right to state that the season was most unfavourable for moss land, and the produce greatly under the average.

TABLE III.—EXPERIMENTS MADE AT DARGAVEL.

No.		Good.			Diseased.			Total.		
		Tons.	cwt.	lb.	Tons.	cwt.	lb.	Tons.	cwt.	lb.
1	White-rocks,	5	15	103	0	1	8	5	16	11
2	Flukes,	1	18	54	0	1	47	1	19	101
3	Skerry-blues,	3	7	27	0	0	13	3	7	40
4	Orkney-reds,	4	12	106	0	0	80	4	13	74
5	Dalmahoys,	4	17	53	0	0	80	4	18	21
6	Regents,	4	7	106	0	1	54	4	9	48
7	Dalmahoys, no manure,	0	10	20	...	...	...	0	10	20
8	do. 2½ cwt. guano, 4 cwt. Lawes' superphosphate,	1	18	22	0	0	46	1	18	68
9	do. 3 cwt. do., 5 cwt. do.	1	14	57	0	0	26	1	14	83
10	do. 4 cwt. do., 6½ cwt do.	1	15	91	0	0	46	1	16	25
11	do. 25 tons farmyard manure,	4	13	88	0	3	50	4	17	26
12	do. 35 tons do.	4	17	79	0	5	66	5	3	33
13	Regents, no manure,	0	6	8	...	...	...	0	6	8
14	do. 2½ cwt. guano, 4 cwt. Lawes' superphosphate,	1	16	100	...	...	...	1	16	100
15	do. 3 cwt. do., 5 cwt. do.	1	14	28	0	0	20	1	14	28
16	do. 4 cwt. do., 6½ cwt. do.	1	12	48	...	...	...	1	12	48
17	do. 25 tons farmyard manure,	4	1	52	0	1	54	4	2	106
18	do. 35 tons do.	4	3	68	0	2	35	4	5	103

The results of these experiments are in many respects different from those of the two preceding series. They are made upon a soil which may be described as being entirely dependent on manures for the production of a crop; and the peculiar interest which attaches to them lies in the fact that the failure to produce a return, so remarkably illustrated by the two plots on which no manure is used, is not due to the absence of the substances the plants require, but is rather to be attributed to the state in which they exist in it. The soil, in fact, is one mass of organic remains, containing, of course, all the constituents of the plants from which it has been derived in great abundance; in proof of which I give the following analysis of the ash of the moss at Dargavel, not exactly from the place on which the experiments were made, but from a spot at some distance, which, however, does not in the least differ from the rest.

Silica,	21.916
Peroxide of iron,	10.914
Alumina,	7.092
Lime,	10.131
Magnesia,	11.706
Potash,	2.410
Soda,	5.100
Sulphuric acid,	11.379
Phosphoric acid,	1.616
Chlorine,	0.571
Charcoal,	16.989
	99.824

The air-dried peat contained 0.80 per cent of nitrogen; so that, as far as the amount of plant food is concerned, it contrasted favourably with many fertile soils; and yet, even after the use of lime, it gave only a few hundredweights of produce—a quantity much under what would be given by even the most sterile of ordinary soils. The addition of a manure, however, immediately exalts the crop; and 2½ cwt. guano and 4 of Lawes' superphosphate, though yielding little except phosphates and ammonia, produce nearly a four-fold increase of Dalmahoys and a six-fold of Regents. Even these quantities, however, are far below an average crop, and it is interesting to note that a farther addition of these manures, in place of increasing, rather diminishes the produce. It would appear, indeed, that artificial manures supplying phosphates and ammonia, when used even in small quantity, enable the crop to take from the peat-soil all the *available* elements there present, and only yield what is, after all, but a trifling increase in the amount of produce. It is by farmyard manure alone, which supplies not one or two, but all the constituents of plants, that a crop can be here obtained; and we see, in fact, not only that it immediately produces a great increase, but that the largest quantity has the best effect. Twenty-five tons of it give a nine-fold increase of Dalmahoys, and a thirteen-fold of Regents. Although the larger amount of dung has a better

effect, it must be observed that it is not by any means in proportion to the increased quantity used—an addition of 10 tons of manure only adding 2 cwt. to the produce of Regents, and 4 cwt. to that of the Dalmahoys; or, putting it in other words, 40 per cent increase in the manure only raised the produce by 2½ per cent in the one case, and 5 per cent in the other. This addition, of course, would not repay the cost of the 10 tons of manure; but it will be understood that its after-effect on subsequent crops might be important. It may be questioned, however, whether, from the particular nature of the soil, it might not be preferable to apply the smaller quantity of manure, and retain the extra proportion for use with the after-crops. That, however, is a question that could not be discussed here without leading us to the consideration of matters far removed from the immediate subject of this paper.

In the two former series of experiments, the quantity of manures used exceeded that employed in the ordinary course of operations on the farm; but in this case the reverse occurred, and the entire field was manured with 35 tons farmyard manure, and 2½ cwt. of superphosphate; and the result of this farther addition, as shown in Nos. 5 and 6, is to produce an increase of upwards of 4 cwt. of Regents, although it is without effect on Dalmahoys. The increase in the quantity of farmyard manure, as in the other experiments, was attended by a larger proportion of disease, although the loss in this way was much smaller than either at Woolmet or Crossburn. It is remarkable, however, that all the kinds of potatoes cultivated with farm-yard manure and superphosphate (in 1 to 6) were much less diseased than those which got none of the latter. It is not easy to trace the cause of this, but most probably it is due to some slight difference in soil or position.

As regards the different varieties of potatoes, we again observe that Flukes prove a failure; but this is attributable to the error committed in planting them, the tubers having been cut, in place of being planted whole, as ought to have been done. The small produce was, in fact, occasioned by a large number of the sets having failed to grow, and those which did succeed yielded an excellent crop; White-rocks now greatly surpass the other varieties, and Skerry-blues stand on a much lower level. The remaining three kinds are nearly on a level.

(To be continued.)

LIST OF PLOUGHING COMPETITIONS *reported to the Society in* 1862-63.

Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal Awarded to
ABERDEENSHIRE—							
1. Ballater Club	Crofts of Glenmuick	30 Jan. 1863	19	½ acre	5 hours	£3 0 0	Alexander Thow, Ballater.
2. Buchan Society	Nether Cortes	31 Dec. 1862	43	Rate of 1 acre	13 hours	4 4 0	Robert Knox, Strichen.
3. Countesswells Association ..	Garen	9 Dec. 1862	15	½ acre	5 hours	3 14 0	Alexander Lawson, Rotten.
4. Forbes and Fordyce Association	Aberdour House Farm	22 Jan. 1863	43	¼ acre	4¼ hours	3 6 0	James Bagrie, Aberdour House.
5. Leochel-Cushnie Society ..	Westerfouls	20 Jan. 1863	34	½ acre	4½ hours	5 3 6	Peter Dunn, Kirkton of Leochel.
6. Mar Association	Blackchambers	8 Jan. 1863	49	36 poles	4½ hours	3 15 0	James Simpson, Easter Skene.
7. Strichen Society	Middlethird	15 Jan. 1863	39	1 rood 15 poles	4 hrs. 15m.	3 1 6	Andrew King, Blackslack.
ARGYLLSHIRE—							
8. Dunoon and Kilmun Society ..	Orchard	29 Jan. 1863	20	½ acre	6 to 7 hours	4 5 0	William Law, Dalilongart.
9. Islay, Jura, and Colonsay Assoc.	Corsapool	27 Feb. 1863	15	½ acre Scotch	8 hours	3 0 0	Peter Currie, Ballivogie.
10. Kilcalmonell Association ..	Largie House Farm	6 Mar. 1863	22	½ acre	5 hours	3 0 0	James M'Neill, Auchinafaud.
11. Killean and Kilkenzie Assoc. ..	Clenagart	13 Feb. 1863	21	1 rood 32 poles	5 hrs. 20 m.	3 4 0	Dugald Matheson, Glenechart.
12. Kintyre Association	Keprigan	20 Feb. 1863	28	1 rood 25 poles	4 hours	4 7 6	Donald Paterson, Moy.
13. Lorn Society	Soraba	28 Feb. 1863	17	1 rood	4 hours	3 0 0	Dugald M'Kichan, Ardvane.
14. Nether Lorn Society	Ardshelloch	18 Feb. 1863	25	½ acre	6 hours	4 2 0	Duncan M'Intosh, Ardnahua.
15. Poltalloch Society	Carnbaan	4 Feb. 1863	19	½ acre	5 hours	3 0 0	Dugald M'Alpine, Ballimore.
16. Saddell and Skipness Society ..	Carradale	12 Feb. 1863	15	½ acre	5 hours	5 17 6	John M'Callum, Carradale Mains.
AYRSHIRE—							
17. Barskimming Society	Barskimming Mills	22 Jan. 1863	20	Rate of 1 acre Sc.	16 hours	4 2 6	Alexander Mair, Barskimming.
18. Colmonell Association	Docherneel	27 Feb. 1863	24	Rate of 1 acre	10 hours	5 0 0	Robert Gilmore, Pinmore.
19. Cumnock Society	Dumfries House Farm	15 Jan. 1863	26	1 rood 9 falls	4 hrs. 56 m.	3 17 6	William Smith, Glenside.
20. Fenwick Society	Tannahill	8 Feb. 1863	29	Rate of 1 acre Sc.	16 hours	5 11 0	Robert Wallace, Hareshawmill.
21. Kilmarnock Club	Grougar Mains	6 Feb. 1863	33	Rate of 1 acre	18 hours	6 7 0	Robert Smith, Craigs.
22. Kirkmichael Society	Cairnhill	10 Jan. 1863	39	40 falls	4 hours	3 0 0	Alexander White, Carcline.
23. Kirkoswald Association ..	Marrieston	21 Feb. 1863	26	68 poles	4 hrs. 57 m.	3 10 0	William Murray, Dinnymick.
24. Mauchline Society	Barskimming	27 Jan. 1863	23	Rate of 1 acre	14 hours	3 18 0	William Wyllie, Mossgiel.
25. Muirkirk Association	Greenock Mains	27 Feb. 1863	16	Rate of 1 acre	10 hours	4 1 6	Robert Maxwell, Greenock Mains.
26. Ochiltree Society	Ochiltree	7 Jan. 1863	20	1 rood 10 falls	4½ hours	3 4 6	Archibald Kirkland, Pennyfadzeoch.
27. New Cumnock Society ..	Polquheys	4 Feb. 1863	20	Rate of 1 acre Sc.	16 hours	3 16 6	Robert Turnbull, Craigman.
28. St Quivox Society	Auchincruive	14 Jan. 1863	23	60 falls	6 hours	4 7 6	William Anderson, Kirkhill.
29. Sorn and Dalgain Society ..	Daldorch	28 Jan. 1863	20	1 rood 30 poles	6 hours	3 10 0	William Sloan, Blairmulloch.
30. Stair and Coylton Association	Hall	16 Jan. 1863	17	1 rood	3¾ hours	3 0 6	Daniel Kirkland, Shiel.
31. Tarbolton Society	Clune	24 Jan. 1863	31	46 falls	5 hours	3 7 10	Robert Stevenson, Lady-Yards.
32. West Kilbride Society	Kirkland	13 Feb. 1863	30	Rate of 1 acre Sc.	12 hours	4 10 0	Robert Montgomery, Woodhead.
BANFFSHIRE—							
33. Spey, Avon, and Fiddochside Cb.	Weirach	10 Dec. 1862	22	½ acre	6 hours	3 6 0	Donald Hendry, Marionburgh.
34. Upper Cabrach Association ..	Buck of Cabrach	1 Jan. 1863	27	1 rood 10 poles	3½ hours	3 4 0	Peter Gordon, Gauch.
BERWICKSHIRE—							
35. Cockburnspath Association ..	Redheugh	15 Dec. 1862	24	¾ acre	6½ hours	4 3 0	Thomas Galbraith, Neuk.
36. Coldstream Club	Hatchetnize	5 Jan. 1863	22	¾ acre	6 hours	6 0 0	James Ford, Simprin.
37. Chirnside Association	Harelaw	22 Jan. 1863	24	½ acre	5 hours	8 0 0	David Johnston, Causeway Bank.

LIST OF PLOUGHING COMPETITIONS (*continued*).

Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal Awarded to
BERWICKSHIRE (*continued*)—							
38. Dunse Club	Chapel	11 Dec. 1862	23	5/8 acre	8 hours	£7 17 6	Andrew Hastie, Knock.
39. Eccles Association	Harperton	24 Dec. 1862	20	3/4 acre	7 hours	4 17 6	Alexander Dawson, Stonefold.
40. Fogo Club	Fogo-east-end	22 Dec. 1862	19	5/8 acre	6 hours	3 17 6	George Davidson, Sisterpath.
41. Gordon Association	Falside	24 Jan. 1863	25	3/4 acre	7½ hours	5 18 0	James Watherstone, Huntlywood.
42. Kimmerghame Society	Bellshill	26 Dec. 1862	20	3/4 acre	7½ hours	3 2 0	James Darling, Kimmerghame Mains.
43. Lammermuir Club	Blackerston	23 Jan. 1863	21	Rate of 1 acre	10 hours	3 0 0	William Dods, Bushel-hill.
44. Westruther Society	Thornidykes	3 Jan. 1863	35	3/4 acre	7½ hours	4 0 6	George Galbraith, Dods.
BUTE AND ARRAN—							
45. Bute Society	Windyhall	30 Jan. 1863	42	Rate of 1 acre Sc.	16 hours	7 18 6	Ninian Duncan, Culevin.
46. Arran Society	Strathwhellan	12 Mar. 1863	25	55 falls	6 hours	5 8 0	Neil Ferguson, Brodick.
CAITHNESS-SHIRE—							
47. Caithness Society	Lochend, Thurso	4 Mar. 1863	61	3/4 acre	6½ hours	3 15 0	Wr. Carmichael, Ratter.
48. Latheron Society	Notingham	11 Feb. 1863	39	1/2 acre	5 hours	7 15 0	Joseph Munro, Clyth Mains.
DUMBARTONSHIRE—							
49. Cardross Society	Cardross Park	16 Jan. 1863	23	60 falls	5½ hours	6 15 0	James Traquair, Cairniedrouth.
50. Dumbarton Society	Chapelton	15 Jan. 1863	19	Rate of 1 acre	16 hours	5 0 0	John M'Bride, Kilmaled.
DUMFRIES-SHIRE—							
51. Dalton Society	Braehill	2 Jan. 1863	17	1/2 acre	5 hours	4 5 6	Jonah Grierson, Rotchell.
52. Kirtle Association	Langshaw	6 Feb. 1863	26	1/2 acre	5 hours	4 7 6	Robert Creighton, Allerbeck.
53. Penpont Society	Cairn Mill	2 Jan. 1863	22	1/2 acre	5 hours	6 6 6	Andrew Telfer, Arkland.
54. Sanquhar and Kirkconnel Soc.	Upper Cairn	7 Mar. 1863	17	1/4 acre	4 hours	4 10 0	William Hyslop, M'Cririck's Cairn.
55. Springkell Society	Chapel Knowe	13 Jan. 1863	21	1/2 acre	5 hours	4 9 6	Robert Tagert, Woodhouselees.
56. Upper Annandale Society ..	Wamphray Gate	3 Feb. 1863	34	1/2 acre	5 hours	6 12 6	David Dinwoodie, Cleughbrae.
57. Westerkirk Association.. ..	Hopsrigg	27 Jan. 1863	17	1/2 acre 6 poles	6½ hours	3 13 0	William Gordon, Milnholm.
EDINBURGHSHIRE—							
58. Borthwick Society	Stobs	23 Dec. 1862	33	1/10 acre	1 hour	4 13 6	William Cowan, Castleton.
59. Cockpen and Newbattle Assoc.	Cockpen	20 Dec. 1862	40	1/2 acre	5 hours	6 15 0	George Rutherford, Lingerwood.
60. Currie Society	Dean Park	30 Jan. 1863	49	1/2 acre	7½ hours	3 2 0	James Naples, Easter Hermiston.
61. Glencorse Association	Cookin	9 Jan. 1863	21	1/2 acre	5 hours	4 10 6	James Noble, Howgate.
62. Lasswade Association	Hillend	9 Jan. 1863	40	1/2 acre	6 hours	4 2 0	Thomas Kerr, Viewbank.
63. Newton Association	Longthorn	23 Jan. 1863	28	1/2 acre Scotch	7 hours	3 11 6	Thomson Black, Cauldcoats.
64. Temple Society	Rosebery	20 Dec. 1862	36	1/2 acre	5½ hours	3 11 6	Charles Lonie, Stobsmills.
ELGINSHIRE—							
65. Abernethy Association.. ..	Lettoch	11 Mar. 1863	22	1/2 acre	5 hours	3 15 0	Donald M'Intosh, Croftronan.
66. Duthil Society	Easter Duthil	3 Mar. 1863	22	1/2 acre	5 hours	3 6 0	John Grant, Easter Duthil.
67. Strathspey Society	Coulnakyle	4 Mar. 1863	27	1/2 acre	5 hours	3 1 6	Francis Grant, Tomben.
FIFESHIRE—							
68. Auchterderran Society	Silvertown	25 Dec. 1862	16	1/2 acre	5 hours	3 2 6	John Mitchell, Pitcairn.
69. Boarhills Society	Kenly Green	22 Jan. 1863	23	Rate of 1 acre	5 hours	3 7 6	David Couper, Kenly Green.
70. Farg Society	Carmore	2 Feb. 1863	23	1/2 acre 25 poles	6½ hours	3 4 0	John Bousie, Eastertown.
71. Crossgate Society	Stevenson's Beath	19 Dec. 1862	32	1/2 acre	5 hours	3 5 0	David Adamson, Halbeath Company.

LIST OF PLOUGHING COMPETITIONS (*continued.*)

Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal Awarded to
FIFESHIRE (*continued*)—							
72. Dunikier Association	Wester Balbeggie	23 Dec. 1862	28	½ acre	5 hours	£3 18 6	Robert Galloway, Cardenbarns.
73. Dysart Society	Bankhead	18 Dec. 1862	30	½ acre	5 hours	3 8 0	David Stenhouse, Balbeggie.
74. Largo Society	Balcormo Mains	17 Dec. 1862	18	½ acre	5 hours	3 5 0	Thomas Geddie, Auchindownie.
75. Leslie Society	North Auchmuir	24 Mar. 1863	31	½ acre 32 poles	7 hours	3 10 0	John Walker, Macedonia.
FORFARSHIRE—							
76. Cortachy Club	Newton, Inshewan	3 Feb. 1863	32	½ acre 20 poles	7 hours	5 4 6	Alexander Grant, Kintyrie.
77. Tanadyce and Oathlaw Club ..	Baldonkie	18 Dec. 1862	46	½ acre	5 hours	3 19 0	James Tosh, Milton of Finhaven.
HADDINGTONSHIRE—							
78. Dunbar, Spott, & Innerwick Cb.	North Belton	29 Jan. 1862	34	Rate of 1 acre	10 hours	4 7 6	William Christie, Woodhall.
INVERNESS-SHIRE—							
79. Badenoch Association	Glentrium	1 Apr. 1863	22	½ acre	5 hours	8 0 0	Alexander Stewart, Gaskbeg.
80. Inverness Society	Balloch of Culloden	4 Mar. 1863	30	½ acre	5 hours	5 15 0	James M'Donald, Hilton.
KINCARDINESHIRE—							
81. Elsick Association	Cairnhill	24 Dec. 1862	22	½ acre	5½ hours	5 12 6	James Paterson, Jellybrands.
82. Durris Association	Westerton	30 Dec. 1862	51	½ acre	3½ hours	6 11 6	Charles M'Hardy, Cairnfauld.
83. Fettercairn Club..	Tillytoghills	6 Dec. 1862	72	½ acre	5 hours	4 0 0	James Stevon, Auchencairnie.
84. Glenbervie Society	East Town	10 Dec. 1862	36	1 rood 25 poles	4 hours	3 12 0	John Thom, East Town.
85. Netherby Association	Trees	16 Dec. 1862	24	1 rood 20 poles	3 hrs. 40 m.	4 5 0	Francis Smith, Monquoch.
86. Portlethen Association	Badentoy	13 Jan. 1863	32	Rate of 1 acre	10 hours	6 10 6	John Gillespie, Mains of Findon.
87. Riccarton Association	Glithno	6 Jan. 1863	23	Rate of 1 acre	10 hours	9 5 0	Hugh Strachan, Cowton.
KIRKCUDBRIGHT—							
88. Glenkens Society	Boatholme	27 Feb. 1863	34	½ acre	5 hours	4 7 6	Robert Riddick, Kells.
89. New Abbey Society	Overton	16 Jan. 1863	23	½ acre	5 hours	5 7 6	Joseph Jardine, Loch-Hill.
90. Penningham, &c. Society ..	Machermore	3 Feb. 1863	38	½ acre	6 hours	5 7 6	James Parker, Polwhilly.
LANARKSHIRE—							
91. Cadder Association	Lumloch	27 Jan. 1863	35	½ acre	6 hours	7 15 0	Robert Paul, High Possil.
92. Culter Association	Threepland	25 Feb. 1863	20	½ acre	5 hours	5 9 0	John Fleming, Coulter.
93. East Kilbride	Turnlaw	27 Jan. 1863	42	½ acre Scotch	8 hours	9 0 0	William Cochran, Clochearn.
94. Old Monkland, &c. Society ..	Kirkshaws	30 Jan. 1863	38	Rate of 1 acre	14 hours	9 0 0	James Dick, Carnbroe.
95. Wiston and Roberton Assoc. ..	Langhill	3 Feb. 1863	21	2½ roods	6 hours	4 5 0	John Forrest, Eastfield.
LINLITHGOWSHIRE—							
96. West Lothian Association ..	Echline	29 Jan. 1863	37	½ acre	7½ hours	5 7 6	William Stein, Mannerston.
NAIRNSHIRE—							
97. Nairnshire Society	Delnies	3 Mar. 1863	43	½ acre	5 hours	4 5 6	James Stewart, Bog of Cawdor.
ORKNEY—							
98. Shapinshay Club	Balfour Mains	24 Feb. 1863	24	2 roods 1½ poles	4½ hours	3 4 0	Malcolm Heddle, Balfour Mains.
99. West Mainland Association ..	Kierfiold	30 Dec. 1862	23	1 rood 30 poles	5 hours	3 6 0	Alex. Rust, Swanney.
PEEBLESSHIRE—							
100. Manor Club	Woodhouse	16 Jan. 1863	18	Rate of 1 acre	10 hours	3 17 6	John Mackay, Bellanridge.
101. Newlands Association	Noblehouse	19 Dec. 1862	19	½ acre	5 hours	3 0 0	Robert Thomson, Noblehouse.

LIST OF PLOUGHING COMPETITIONS (*continued*).

Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal Awarded to
PEEBLESSHIRE (*continued*)—							
102. Peebles Society	Bonnington	15 Jan. 1863	26	Rate of 1 acre	10 hours	£4 12 0	John Tod, Mallingsland.
103. West Linton Society	Linton Cottage Farm	23 Jan. 1863	24	¾ acre	7 hours	3 15 6	John Bennet, Medwyn Mains.
PERTHSHIRE—							
104. Abernethy Association	Abernethy	10 Jan. 1863	22	½ acre	6½ hours	3 16 6	William Wanning, Ballo Mills.
105. Alyth and Airlie Society ..	Nether Balloch	17 Dec. 1862	41	½ acre	5 hours	11 18 0	James Moncur, Bankhead.
106. Ardoch Society	Whitteston	3 Mar. 1863	17	⅓ acre Scotch	4½ hours	3 0 0	John M'Gregor, Bennie.
107. Arnprior Association	Faraway	28 Jan. 1863	25	Rate of 1 acre	14 hours	4 17 6	Alexander M'Gregor, Easter Culmore.
108. Auchterarder Society	Westerton	10 Feb. 1863	22	½ acre	5 hours	3 2 0	James MacDonald, Kirkton.
109. Blairdrummond, &c. Club ..	Westwood	7 Jan. 1863	28	½ acre	5½ hours	5 3 0	Robert Hill, Hill of Drip.
110. Callander Society	Mollands	25 Feb. 1863	15	⅓ acre	6½ hours	3 19 6	Donald Mackay, Mid Torrie.
111. Drummond Castle Society ..	Dargil	28 Jan. 1863	20	Rate of 1 acre	14 hours	12 2 0	Thomas Marshall, Temple Mill.
112. Fossoway Association	Threepmuir	9 Jan. 1863	19	½ acre	5 hours	3 6 0	James Macfarlane, Craiglaw Hill.
113. Glenalmond Society	South Buchanty	23 Feb. 1863	23	½ acre	5 hrs. 15 m.	3 18 0	John M'Raw, Connachan.
114. Glengarrie & Glenerrochie Assoc.	Bruar	12 Mar. 1863	16	½ acre	5 hours	6 6 6	Alexander M'Intosh, Tomnacuaig.
115. Menzies Estate Association ..	Menzies Castle Home Fm.	16 Mar. 1863	32	½ acre	5 hours	8 2 6	Robert Menzies, Tullichville.
116. Monzievaird and Strowan Assoc.	Brae of Monzievaird	4 Mar. 1863	22	½ acre	6 hours	8 17 0	John M'Gregor, Strowan.
117. St Martin's Society	Bogs of Melginch	11 Feb. 1863	28	½ acre	5 hours	4 0 0	John Davidson, Mavisbank.
118. Port of Monteith & Ruskie As.	Lennieston	18 Feb. 1863	16	Rate of 1 acre	12 hours	3 3 0	James Liddell, Lennieston.
119. Strathbraan Association ..	Meikle Logie	18 Mar. 1863	15	½ acre 5 poles	6½ hours	3 5 0	Peter M'Duff, Balinlic.
120. Stormont Society	Delvine	17 Dec. 1862	57	½ acre	5 hours	5 5 6	Alexander Mackintosh, Newton.
121. Strathearn Central Association	Bogtoulea	5 Feb 1863	19	½ acre	5 hours	3 0 0	Thomas Duff, Cairnie.
122. Thornhill Society	Middlefrew	11 Feb. 1863	21	Rate of 1 acre	11½ hours	3 10 0	David Miller.
ROSS AND CROMARTY SHIRES—							
123. Lews Society	Melbost	12 Mar. 1863	17	¾ acre	7 hours	3 0 0	Alexander Munro, Coll.
124. Old County of Cromarty Assoc.	Glen Urquhart	24 Feb. 1863	38	½ acre	5 hours	8 17 0	Evan Mackenzie, Navity.
125. Wester Ross Club	Kinnairdie	28 Feb. 1863	40	½ acre	5 hours	3 7 6	Hugh M'Lean, Arcan.
ROXBURGHSHIRE—							
126. Melrose Club	Thornielaw	24 Dec. 1862	35	½ acre	5 hours	5 17 6	Thomas Thomson, Hawick.
127. Union Society	Spylaw	11 Feb. 1863	58	⅔ acre	6 hours	4 15 0	George Mullians, Cessford.
STIRLINGSHIRE—							
128. Bannockburn and Plean Assoc.	Milton	28 Jan. 1863	26	½ acre	5 hrs. 10 m.	5 7 6	William Tennant, Thorn.
129. Hillfoot Association	Carslepow	23 Dec. 1862	18	½ acre	5 hours	3 10 0	Thomas Fisher, Gartenkier.
130. Killearn, &c. Society	Letter	26 Feb. 1863	18	1 rood 20 poles	5 hrs. 15 m.	4 5 0	James Paul, Drumbeg.
131. Logie and Lecroft Society ..	Westlees	27 Jan. 1863	19	Rate of 1 acre Sc.	14 hours	4 2 6	John Dempster, Cottonhaugh.
WIGTOWNSHIRE—							
132. Inch Association	Whiteleys	24 Feb. 1863	41	½ acre	5 hours	4 12 6	James Galloway, Gallowhill.
133. Kirkmaiden Association ..	Killumpha	3 Jan. 1863	50	½ acre	6 hours	5 0 6	Anthony M'Guffie, Drumore.
134. Machars Society	Baldoon	27 Jan. 1863	32	.. ..	.. ..	4 13 0	Peter M'Clumpha, Claycrop.
135. Old Luce Association	Droughdool	31 Jan. 1863	34	½ acre	5 hours	5 13 0	John Kerr, Droughdool.
136. Stoneykirk Association ..	Freugh	7 Jan. 1863	39	½ acre	5 hours	6 0 0	Joseph Hamilton, Dumbreddon.

RETURNS OF SEED COMPETITIONS held in 1862 and 1863.

Districts.	Seed exhibited in Competition by Growers to whom Silver Medals were awarded. — Name of Species and Varieties.	Quantity.	No. of Competitors.	Award.	Competitors to whom Silver Medals were Adjudged. — Christian Name and Surname.	Estate or Farm, and Post Town.	Produce per Imperial Acre.	Weight per Bushel.	Date of Sowing.	Date of Reaping.	Ground on which the Prize Seed was Grown. — Altitude.	Exposure.	Nature of Soil.
		Qrs.					Qrs.	Lb.			Feet.		
Ayrshire. Oct. 30, 1862.	Wheat (Archer's Prolific),	3	4	1 10 0	Capt. Campbell of Craigie,	Craigie, Ayr.	44 bush.	64	Nov. 12, 1861,	Sept. 17, 1862,	100	South	Light sandy loam.
	Chevalier Barley,	3	4	1 10 0	James Reid,	Mid-Sanquhar, St Quivox,	8	57	April 1, 1862,	Sept. 8, 1862,	40	South	Light sand.
	Oats (Tam Findlay),	2	8	1 10 0	Robert Montgomerie,	Cockhill, Dundonald,	6	44	Mar. 25, 1862,	Sept. 23, 1862,	50	South	Sandy loam.
	Perennial Ryegrass,	2 bush.	6	1 10 0	William Dickie,	Holmes, Kilmarnock,	7 bolls	25	April 1, 1862,	Aug. 1, 1862,	about 100	East	Light earthy soil.
Inverness. Oct. 28, 1862.	White Wheat,	3	3	3 0 0	Evan Logan,	Stoneyfield,	3½	63	First week of Dec.,	Last week of Sept.,	100	South	Gravelly black loam.
Wester Ross. Nov. 23, 1861.	White Essex Wheat,	3	3	1 5 0	Alexander Allan,	Drummond, Evanton,	4	64	Nov. 16, 1860,	Sept. 20, 1861,	40	South	Deep loam—gravel below.
	Norfolk Barley,	3	2	1 5 0	William Walker,	Fyrish, Evanton,	4.6	57½	April 18, 1861,	Sept. 8, 1861,	250	South	Light sharp black mould.
March 1, 1862.	Sandy Oats,	3	2	1 5 0	Do.	Do.	5	44	Mar. 27, 1861,	Sept. 12, 1861,	250	South	Do.
	Perennial Ryegrass,	2	2	1 5 0	Kenneth Grant,	Kinellan, Strathpeffer,	2.2	28	April 1860,	July 21, 1861,	450	South	Light mould on rotten rock.
Nov. 18, 1862.	Red Straw White Wheat.	3	2	1 5 0	William Allan,	Dromanreach, Dingwall,	2	64	Nov. 18, 1861,	Sept. 20, 1862,	150	North	Black loam.
Black Isle, Ross-shire. March 5, 1863.	Chevalier Barley,	3	2	1 0 0	Donald M'Kay,	North Kessoch, Inverness,	4	57¼	Mar. 31, 1862,	Sept. 12, 1862,	150	S.-W.	Gravelly soil.
	Sandy Oats,	3	5	1 0 0	Patrick M'Lean of Hawkhill,	Weston of Baddery, Fortrose,	5½	45¼	April 2, 1862,	Oct. 10, 1862,	400	South	Brown loam.
Stirlingshire. Oct. 24, 1862.	Wheat (M'Ewan's Prize-Taker),	3	6	1 0 0	Thomas Murdoch,	Westwood, Stirling,	3	63	2d week of Nov. 1861,	Middle of Sept. 1862,	20	General	Clay loam.
	Early Blainslie Oats,	3	15	1 0 0	John Blair,	Clayhills, Cambusbarron, Stirling,	4	42	Mar. 26, 1862,	Aug. 25, 1862,	80	South	Gravelly loam.
	Common Barley,	3	8	1 0 0	James Anderson,	Cornton, Stirling,	4	57	Last week of Apr. '62,	End of Aug. '61,	20	General	Clay kerse.
Mar. 18, 1863.	Sandy Oats,	3	18	1 0 0	Thomas Murdoch,	Westwood, Stirling,	4½	43	First week of April,	3d week of Sept.,	30	South	Clay.
	Common Barley,	3	4	1 0 0	John Blair,	Clayhills, Cambusbarron, Stirling,	4	56	First week of May,	First week of Sept.,	100	South	Gravelly soil.

ON THE FORMATION AND MANAGEMENT OF YOUNG PLANTATIONS.

By C. Y. MECHI, Duthill, Cambridge.

[Premium—The Gold Medal.]

THE following report applies to three different plantations, two of them in the county of Roxburgh, in the south of Scotland, and one in the county of Sussex, in the south of England. I have selected those three plantations, because in each there is some peculiarity which may not be generally known, and in each partial failure as well as success is to be found.

No. 1 is a mixed hardwood plantation in Roxburghshire, comprising about 20 acres, which were planted partly in the spring of 1853, and the remainder by the end of April 1854. The planting and draining were performed by contract, and fencing, carriage of plants, &c., by day-work.

The hardwood plants comprise oak, ash, elm, and sycamore; and the soft-wooded plants, silver fir, larch, spruce, and Scots pine.

The ground planted was partly fallow, partly old lea, and a small portion of it, about 4 acres, under rough, coarse, natural grasses, growing upon very wet moss.

The plantation is situated at an altitude of from 500 to 600 feet above the level of the sea, and surrounded in the distance by hills from 1000 to 1200 feet in height.

The hardwoods were planted in pits 10 feet apart over all the ground, except upon the wet mossy part, which was planted with spruces alone at 10 feet distance in pits 16 inches deep and 16 inches wide.

Silver firs were planted amongst the hardwoods at 30 feet apart, in pits 14 inches wide and 14 inches deep.

The ground was next gone regularly over with larch and Scots pine, planting two of the former to one of the latter, and filling up the whole with trees 4 feet apart.

The principal inducements for planting No. 1 were with a view to produce shelter to the stock upon the farm, which, the tenant maintained, was necessary for his flock. The bottom-land of the glen was also believed to produce grasses which gendered rot amongst the sheep. From the nature of the ground it was not only all but impossible to plough it, but the grain was always so much laid as to be nearly useless, and it was with great difficulty and danger that it could be carted off the ground. These were the principal reasons the tenant had for desiring the plantation to be formed. The proprietor's object, apart from that of the tenant, was to secure a supply of wood upon his estate; to dispose of the thinnings for propwood, fencing, net-stakes, or fuel, in the best market; to

produce cover for game; to ornament, clothe, and beautify the estate; and, finally, the matured crop of hardwood is expected to pay a considerably higher rent for the ground it occupies than could be derived from it under any other form of crop, together with compound interest upon the original outlay.

ENCLOSING.

The fence with which the enclosure was made is wire stretched upon wooden posts. The straining-posts are larch 7½ feet long, 7½ by 7½ inches, sunk into the ground from 3½ to nearly 4 feet, and on an average distance of 75 yards apart. The intermediate posts are also larch, 6 feet long, and 5 inches diameter at small end, where they are round: if once sawed through the centre, they are 6 inches by 3 inches; and if quartered or sawed from large wood, they are 4 by 4 inches, sharpened to go into the ground, in the form of a wedge, 18 inches long. They are driven into the ground at 5 feet apart, with cast-metal malls 12 lb. weight; holes for the reception of the small posts are made with an iron piercer; the piercer itself is of solid wrought-iron steeled on the point; the part that enters the ground is in the form of a wedge, 18 inches long, 3½ by 2¼ at base, and 2 inches by ¼ at point; the handle, which is welded to the end, is 3 feet long, 1¼ diameter, with a swell so as to fill the hand; the entire length is 4 feet 8 inches, and weighs 40 lb. The posts, when driven in and levelled on the top, stand 3 feet 10 inches high. The two top wires No. 4, the third one No. 5, and the three bottom wires No. 6, were divided upon the posts in the following order:—Division 1st, from top wire, 11 inches; 2d, 9 do.; 3d, 7 do.; 4th, 6 do.; and 5th, 6 do. The bottom wire is 5 inches from the surface of the ground, and the top wire 2 inches below the top of the small posts, and 6 inches below the top of the straining-posts; holes are bored through the centre of the straining-posts with a ¾-inch auger for the reception of the wires, which are drawn up to them. The wires are fastened to the small posts by means of staples 2½ inches long. The straining-posts are put in in the lowest parts of the ground, and at all angles of the fence. Where curves occur, the small posts are braced inside with 6-feet length braces, 4 by 1¼ inches. The ground along the run of fence was levelled to about 5 inches from the bottom wire with turf.

GATES.

For the sake of clearing the plantation, it was necessary to have a road through it and a gate at each end: the straining-posts were put in so as to answer for gate-posts, therefore only one extra post was required for the gate: there were also two hand-gates upon it for the convenience of hunters; they also only required

one post extra each. The gates were made of the best larch, and painted.

DRAINS.

The ground, on being tested, was found sufficiently dry for the growth of trees, except the mossy part along the bottom where the rough herbage prevailed; this was drained with 2-inch tiles 4½ feet deep at irregular distances, averaging 35 feet apart. The ground, being mossy, was easily drained; and as there was very little fall to the drains, there was an excellent outlet into an old open ditch. The principal reason for adopting the tile-drain in place of the open surface-drain was in consideration of the game. It is maintained that no open drain is efficient if less than 30 inches deep; and at that depth, if the young brood should happen to fall into them, they are unable to extricate themselves. Under-draining has in this instance so far, at least, proved highly successful. The ground, on being dried, made solid, its surface kept level, there is no danger of drowning game. It is an advantage also in the ultimate clearing of the wood, by avoiding the inconvenience of open drains or ditches where horses require to go in to draw the wood off the ground. Open drains, too, have no small tendency to cause trees to blow down with the wind.

PLANTING.

In planting the hardwood, care was taken to confine the oaks and ash to the clayey slopes, planting one of the former for two of the latter. This was done with a view of thinning out the ash first, which, when it constitutes the principal crop, is, as is well known, much more valuable in the young state than oak.

The sycamore was also planted by itself on the most exposed parts, particularly where the soil is of a light sandy nature.

The elms were mixed with one-third part of oak, and were planted upon the dry alluvial parts. This was also done with the object of thinning out the elm, it being also more valuable when young than oak. The pits for the hardwoods were specified to be 18 inches wide, and 18 do. deep, upon the ground that was in fallow; and increased to 24 inches wide and 20 inches deep upon the old lea.

The ground, having all been gone over with hardwoods, was next gone over with silver firs, which were planted 30 feet apart over all, except the deep mossy ground. This being done, the ground was lastly gone over with larch and Scots pine, planting two of the former to one of the latter—filling up the whole with trees 4 feet apart.

The newly-drained mossy ground was planted with spruces in pits 16 inches by 16 do., at the distance of 10 feet apart. These plants were about 3 feet high when put in, and having stood one year in a nursery, were taken up with abundance of roots and earth about them, which explains the rapidity with which they afterwards grew.

EXPENSE OF ENCLOSING, INCLUDING WIRE AND EXPENSE OF PUTTING UP.

	£	s.	d.
To 1800 yds. of fence, six wires deep, 2 No. 4, 1 No. 5, 3 No. 6, at 5d. per yd.,	£37	10	0
„ 24 straining-posts, 7½ ft. long, 7½ by 7½ inches (best larch), at 2s. 6d. each,	3	0	0
„ 1080 small posts, 6 ft. long (best larch), at 4½d. each,	20	5	0
„ 150 braces for curves in fence, 6 ft. long, 4½ × 1¼ (best larch), at 1½d. each,	0	18	9
„ 72 braces for stretching-posts, 3½ ft. long, 6 × 3 (best larch), at 3d. each,	0	18	0
„ 1800 yds. of fence, making up to level of 5 inches below under wire, at ¾d. per yd.,	5	12	6
„ 24 straining-posts, digging out holes for, firmly bracing, &c., at 2s. each,	2	8	0
„ 1080 small posts, driving and levelling the heads of, at ¾d. each,	3	7	6
Total for enclosing,	£73	19	9

£73, 19s. 9d. ÷ 1800 = 10d. per yd.

GATES.

	£	s.	d.
To making, painting, and hanging with double bands two gates, at 20s.,	£2	0	0
„ do. do. do. do. two hand-gates at 13s.,	1	6	0
„ 2 gate-posts for large gates, at 2s. 6d. each,	0	5	0
„ 2 do. for hand-gates, at 2s. 6d. each,	0	5	0
Total for gates,	£3	16	0

PLANTING AND PLANTS.

	£	s.	d.
To 1,000 elm plants, 3½ ft. at 30s. per 1000,	£1	10	0
„ 2,200 oak plants, 2 „ at 25s. „	2	15	0
„ 1,200 plane-tree 2 „ at 35s. „	2	7	0
„ 2,600 ash 3 „ at 22s. „	2	17	2
„ 1,750 silver firs, 2½ „ at 25s. „	3	10	0
„ 700 spruce, 3 „ at 25s. „	0	17	6
„ 11,800 Scots pine, 1½ „ at 15s. „	8	17	0
„ 23,000 larch, 2½ „ at 20s. „	23	0	0
„ planting larch and Scots pine, 34,800, at 5s. per 1000,	8	14	0
„ „ spruce and silver firs, 2450, at 10d. per 100,	1	0	5
„ „ hardwoods, oak, ash, plane, 7000, at 1s. per 100,	3	10	0
„ carriage of plants 4 miles, and sheughing into ground (carefully),	3	5	0
Total for plants and planting,	£62	3	1

£62, 3s. 1d. ÷ 20 ac. = £3, 2s. 2d. per ac.

DRAINAGE.

	£	s.	d.
To cutting 320 roods, drains 4½ feet deep, at 10½d. per rood,	£14	0	0
„ 5800 2-inch tiles laid down, at 22s. per 1000,	8	7	7
„ laying tiles and filling in drains, at 1½d. per rood,	2	0	0
Total for drainage,	£24	7	7

£24, 7s. 7d. ÷ 4 ac. = £6, 1s. 10d. per ac.

Abstract.

	£	s.	d.
Enclosing,	£73	19	9
Gates,	3	16	0
Plants and Planting,	62	3	1
Drainage,	24	7	7
	£164	6	5 ÷ 20 ac. = per ac. £8, 4s 4d.

I made a minute examination of the annual growths of No. 1 plantation at different periods, though I had not the opportunity of doing so every year. The following Table will show the size of each kind at the time of planting, and the annual growths made during nine years, and the size of each at the date of report.

The trees are counted and measured in several places throughout the plantation; an average of 100 trees is taken, and that average 100 trees classed in three classes; 1st, largest 33 trees in each 100; 2d, 33 of the next largest of each 100; 3d, 34 or medium class.

	Average size when planted, 1854.	Growths in 1854.	Growths in 1855.	Growths in 1856.	Growths in 1857.	Growths in 1858.	Growths in 1859.	Growths in 1860.	Growths in 1861.	Growths in 1862.	Size of Tree in 1862.	
	Feet.	in.	in.	in.	in.	in.	in.	in.	in.	in.	ft.	in.
Oaks—												
Class 1st, 33 trees, . .	3	1½	2¼	3½	5	7	8	9	12	12	8	0¼
,, 2d, 33 ,, . .	2	1	1½	2	3	4	5	5½	7	8	5	1
,, 3d, 34 ,, . .	1½	½	½	1¼	2	2½	2½	3½	4	5	3	3¾
Ash—												
Class 1st, 33 trees, . .	3	1½	1½	3	4	7	7	8	10	12	7	6
,, 2d, 33 ,, . .	2	1	1	1½	2½	5	5	6½	6½	7	5	0
,, 3d, 34 ,, . .	1½	½	½	¾	1	2	3	3	3½	4	8	0¼
Elm—												
Class 1st, 33 trees, . .	4	2	2	3	4	6	8	8½	9	10	8	4½
,, 2d, 33 ,, . .	3	1	1½	1½	2	2½	5	5	6	6	5	6½
,, 3d, 34 ,, . .	2	½	¾	1	1½	2	2	2½	3	3	3	4½
Sycamore—												
Class 1st, 33 trees, . .	3½	1½	2	3	4	6	7	8	9	12	7	11
,, 2d, 33 ,, . .	2	1	1¼	1½	2½	3½	4	5½	6½	7	4	9½
,, 3d, 34 ,, . .	1½	½	½	1	1	1½	2	2½	3½	4	2	10½
Silver Fir—												
Class 1st, 33 trees, . .	2½	2	2	2	2½	3	6	9	12	15	6	11½
,, 2d, 33 ,, . .	2	1	1	1	1	2	4	5	6	8	4	5
,, 3d, 34 ,, . .	1½	½	½	½	½	1	2½	2½	3	4	2	9
Spruce—												
Class 1st, 33 trees, . .	3½	5	7	9	13	15	16	18	20	24	14	1
,, 2d, 33 ,, . .	3	4	5	6	8	9	10	11	12	15	9	8
,, 3d, 34 ,, . .	2½	2	2	3	4	6	7	8	9	10	6	9
Scots Pine—												
Class 1st, 33 trees, . .	2	6	8	10	11	13	16	18	19	22	12	3
,, 2d, 33 ,, . .	1½	3	4	6	6	6½	8	8½	9	10	5	9
,, 3d, 34 ,, . .	...	½	1½	1½	2	2	4½	5	6	6	2	6
Larch—												
Class 1st, 33 trees, . .	3	6	7	9	11	15	16	18	19	22	13	3
,, 2d, 33 ,, . .	2½	4	5	5	6	7	8	9	10	11	7	11
,, 3d, 34 ,, . .	2	½	1	1½	2	4	4½	5	5	6	4	5½

The difference of size in each class of trees at the end of nine years may appear remarkable, but when we take into account their numerous enemies, it will not appear so strange, and the disproportion which the 1st class bears to the 3d class will be found the rule and not the exception throughout all plantations until they are thinned several times. I have generally found that a young plantation, after being thinned the first time, so far equalises the growth as to alter the proportion as given above entirely—leaving only

class 1st and class 2d; this, of course, at same time raises higher the proportional growths in each class.

State of No. 1 at the present time.—The fence, so far as a protection is spoken off, is as good as ever; the posts which were made round, have split with the sun in some cases where the staples were driven in; the staples consequently have fallen out, and have been renewed. To all appearance no posts will be required for four or five years to come. The top wire was several times broken by cattle the first and second year after being erected, by their attempting to leap it; but since they got used to it, they have not done more mischief.

The Drains are in an efficient state; the ground remains perfectly dry, though little water is now running in the tiles.

Part of the trees are nine and part ten years planted. The grasses, which are rank upon the deep soil, over-grew the spruces, and in some cases totally broke them down the first and second seasons after planting. Snows lodged upon them in their recumbent state, and in this position they remained till the young wood began to form in spring, when the young shoot took an upright position; the stem of the tree at same time being in a horizontal position, bent the young trees, and many of them still retain it, but these can be thinned out the first thinning without causing any serious blanks in the plantation.

The average growths given in the Table on preceding page were taken only from the part first planted. As the other portion is nearly the same in every respect, only one year younger, I have not given the growths of it.

The oaks upon the clay soil are making rapid top-growths, and are clean and healthy in the bark, but are a little deficient of side branches, owing, no doubt, partly to their being too crowded by the larch and Scots pines, which are close upon them.

The ash are looking well, clean in the bark, and beginning to grow fast, with a few exceptions where the hares have peeled off the bark. In such cases the trees have mostly died down to the surface of the ground, where several young shoots have come up, and which require attention in the way of pruning.

The elms which were cut over the second spring after planting are now fine, handsome, healthy trees, but a number of them have not yet formed a leading top, and now require pruning in order to give the top growth a proper direction.

The sycamores on the most suitable soil are doing well, but those on the bare knolls are somewhat stinted in growth, and in a few cases have died down to the ground, owing evidently to the plants being too large and badly rooted when planted. Those plants which have died down have produced suckers, which are yet likely to become good trees; pruning, however, is urgently required.

The Scots pines are thriving well, but in some cases the larches have overtopped them.

The silver firs are now making good growths, but were slow in coming away at first. Some of them are double, and require the pruning-knife.

The larches, as a whole, are doing well; in a few cases, however, in the bottom of the glen, the frost in April 1859 destroyed them considerably, thus showing the advantage of confining spruce to low damp places.

No. 2 plantation is of 10 acres. Situated at an altitude of from 800 to 900 feet above the level of the sea, the ground lies in a sloping direction towards the north. The soil is mostly of a thin gravelly nature. The plantation was formed in 1853; the work of fencing and planting was commenced in January, and finished in April the same season.

The work of planting was performed by men on day wages, and the fencing by contract. A foreman was appointed to see the work properly executed, and who received general instructions with regard to it from the forester. The people employed were usually eight men and nine women or lads; the odd person was engaged carrying the plants, sizing them in the plant-bed so as to suit the rough or bare ground, to assist in sheughing in the plants when unloaded, &c.

The fence, which was built of turf, with a two-bar paling on top, was contracted for. The following are the conditions and specifications:—

The Dyke, when finished, to stand 5 feet 6 inches high from bottom of ditch to the top, to be 4 feet wide at bottom, and 20 inches wide at top.

Ditch in front, 4 feet wide at top, 3 feet wide at bottom, and 18 inches deep.

The paling rails to be in 18-feet lengths, $3\frac{1}{2}$ by $1\frac{1}{8}$, and four posts to the rood, each 4 feet long, $3\frac{1}{2}$ inches by $3\frac{1}{2}$ inches, to be properly nailed with 4-inch patent flat-point nails, the joints to be secured with 3-inch nails of the same description; the whole work to be finished by the 31st of January 1853, for the sum of 5d. per yard.

Drains.—There being a spring near the centre of the plantation, which caused about half an acre to be in wet; to remedy this, a drain was cut through the lowest part in the fence, and continued to the top of the spring. It was cut 30 inches deep, and 30 inches wide at top, and 12 inches wide at bottom, and was performed in frosty weather by the planters when too hard for planting operations. The length of the drain is 160 yards, and cost $1\frac{1}{2}$d. per yard in cutting and spreading the earth excavated equally on each side of the drain.

Object in forming No. 2.—The principal reasons were to secure shelter for the sheep upon the farm; to clothe a bleak, bare, and weather-beaten hillside; to produce wood upon the estate for local purposes, such as repairs of farm-buildings, gates, and fencing, &c.

Planting.—With the above object in view, notwithstanding the high altitude, some of the most suitable patches were planted with

sycamore and beech. These were planted at 30 feet apart, and mixed with pine.

One bare knoll, where grasses of every description refused to grow, being composed of a shifting sand, was planted with elder; cuttings were stuck in at 3 feet apart, it being considered that nothing else would grow—not even the Scots pine itself.

The sides of the drain, and where the ground was at all wet, were planted with spruces at 8 feet apart in pits.

Two small patches of about half an acre each, where the ground was rich, were planted with elm 20 feet apart, and mixed with larch to the distance of 4 feet apart over all.

The whole ground, except amongst the spruces, was made up with Scots pine to 4 feet apart.

EXPENSE OF ENCLOSING.

To turf-dyke, as per contract, 940 yds. at 2d. per yd.,	£7	16	8
„ 2 bar-paling, as per contract, 940 yds. at 3d. per yd.,	11	15	0
„ 3 lb. whin-seed and sowing,	0	10	0
Total for enclosing,	£20	1	8

DRAINAGE, EXPENSE OF.

To cutting and spread the earth excavated, 160 yds. of drain, at 1½d. per yd.,	£1	0	0
Total for draining,	£1	0	0

PLANTING, EXPENSE OF.

To planting 350 hardwoods of sorts, in pits 24 × 20 deep, at 2s. per 100,	£0	7	0
„ 100 elder cuttings, making and planting,	0	1	6
„ 350 spruce, in pits 24 in. by 20 deep, at 2s. per 100,	0	7	0
„ 23,825 Scots pine, notching in, at 5s. per 1000,	5	19	6
„ 2,600 larch, do., at 5s. „	0	13	0
Carriage of plants 3 miles, and sheughing into the ground,	1	15	0
Total for planting and carriage,	£9	3	0

PLANTS, COST OF.

To	150 sycamore plants,	2½ ft.,	at 35s. per 1000,	£0	5	3
„	50 birch,	3 „	at 35s. „	0	1	9
„	100 elms,	3 „	at 30s. „	0	3	0
„	350 spruce,	3 „	at 25s. „	0	8	9
„	23,825 Scots pine,	1¼ „	at 10s. „	11	18	3
„	2,500 larch,	1½ „	at 12s. „	1	10	0
	Total for plants,			£14	7	0

Abstract.

Enclosing,	£20	1	8
Drainage,	1	0	0
Planting,	9	3	0
Plants,	14	7	0
	£44	11	8 ÷ 10 ac. = £4, 8s. 2d. per ac.

The turf dyke, though a pretty good fence against sheep, is indeed a very insufficient one for cattle: during hot weather, when flies are troublesome, they naturally resort to the dykeside, and then a few

of them will sometimes level several yards of it in a short time. The only means of partially preventing this is to fasten thorns along the front of the dyke by means of hooked wooden pins; and after all, this is only a partial remedy.

The following Table shows the height of each class of trees when planted, the size of each at the present time, and the average growths each has made for the last ten years. Some might prefer making a greater number of classes, but I find, in valuing any plantation below timber size, that three classes are quite sufficient for practical purposes, and for that reason I here give only three classes. In order to arrive at the real growth of a plantation, the labour is very considerable; not the classification, but the true average of 100 trees, from which the classes are taken.

	Height of Tree when planted.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	Height of in 1862.	
Sycamore—100.	feet.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	feet.	in.
Class 1st, 33 trees, . .	3	1	2	2½	3	5	6	7	8	10	13	7	9½
,, 2d, 33 ,, . .	2½	½	1	1	1½	2	3	3	4	5½	6½	6	9
,, 3d, 34 ,, . .	2	0	½	½	1	1	1½	1½	2	2½	3	3	1½
Beech—50.													
Class 1st, 16 trees, . .	3½	½	½	1	1	1½	2	4	7	10	12	6	½
,, 2d, 16 ,, . .	3	0	0	½	½	1	1	2	4	5	6	4	8
,, 3d, 18 ,, . .	2½	0	0	0	½	½	1	1	2	3	4	3	6
Elm—100.													
Class 1st, 33 trees, . .	3½	1½	2	2	3	5	6	8	10	12	14	8	9
,, 2d, 33 ,, . .	3	1	1	1½	1½	2	3	3½	5	6	7	5	7½
,, 3d, 34 ,, . .	2½	½	½	1	1	1	1½	1½	2	3	3½	3	9½
Elder cuttings—100.													
Class 1st, 33 trees, . .	0	6	9	11	13	16	18	18	19	20	21	12	7
,, 2d, 33 ,, . .	0	3	6	9	9	10	12	15	15	16	16	9	3
,, 3d, 34 ,, . .	0	2	4	6	7	7	9	10	11	11	12	6	7
Spruce—100.													
Class 1st, 33 trees, . .	3½	2	3	3½	4	6	9	12	14	15	18	10	8½
,, 2d, 33 ,, . .	3	1	2	2½	3	5	7	8	9	10	11	7	10½
,, 3d, 34 ,, . .	2	0	1	2	3	3	4	5	5	6	7	5	0
Scots pine—100.													
Class 1st, 33 trees, . .	2	2	2½	3	4	6	7	8	9	10	12	7	3½
,, 2d, 33 ,, . .	1½	1	1½	2	3	4	4	5	5	6	6	4	7½
,, 3d, 34 ,, . .	1	½	1	1	1½	2	2	2½	3	3	3½	2	8
Larch—100.													
Class 1st, 33 trees, . .	2	2	2½	3½	5	7	10	14	15	17	18	9	9
,, 2d, 33 ,, . .	1½	1	2	3	3	4	6	8	9	10	11	6	1
,, 3d, 34 ,, . .	1	1	1	1½	1½	2	3	4	4	6	6	3	6

The above Table shows in the first column, from top to bottom, the height of each class of trees at the time of planting. The next ten columns show the average lengths of shoot each class of trees made every season. It must not, however, be thought that the same individual trees remain always in the same class; for example, game may destroy the bud or the leading shoot at any time, and by this means the plant will stand in a class lower than it did before—that is, if the shoot produced next season falls short of what grew

the year before the accident happened. It will be observed how striking the difference is between the first and third class of Scots pine; the first is 7 feet 3½ inches, and the third 2 feet 8 inches. This is occasioned by the black game picking out the buds of the Scots pine upon a portion of the plantation where they resort during winter. I found buds picked out as early in the season as October, and as late in spring as April. I believe February is the worst month in the year for game picking out the buds of the Scots pine. In the plantation under consideration there is about one acre of heathy ground, and the Scots pines upon it at the present time scarcely average 24 inches—occasioned by the black game picking out the buds.

The Larch upon the best of the ground are making annual top-growths of 15 to 18 inches, and the tallest of the trees are fully 10 feet high. The soil has more to do with the healthy growth of larch than the altitude. I could adduce numerous instances to show that this tree will thrive at altitudes as high as the Scots pine will, if the soil is suitable to it. Larch having been planted throughout the ground rather injudiciously as regards soil, the consequence is that many of them are not over 3½ feet in height, and will not, under the circumstances, attain timber-size trees.

The Spruce.—There being little of the soil adapted to the growth of spruce, a few only were planted by the sides of the drain, which are in a very healthy growing state, some of them making top growths 20 inches long. The tallest of the spruces are about 11 feet high.

The Elder.—Cuttings were made about 12 inches long, and inserted by means of an iron rod to about half their length upon the barest of the ground: the cuttings rooted readily, although there was little soil—only loose sand. The plants at this time are quite clothing the bare knoll, and are healthy.

The Elms are in general healthy, and the best of them making shoots from 12 to 16 inches in length, and are 9 feet high. There are a few, however, which have suffered from hares having pulled off the bark during snow and frosty weather in the winter. Ash might have succeeded equally as well as the elm, as regards soil and climate, but the elm is a better tree in the landscape, and less liable to be destroyed by hares.

The Sycamores are doing well in general, but a few are in requirement of pruning in order to give the leading shoot a proper direction. The best, the most healthy, and tallest, are from plants cut over in April the second year after planting.

The Beech, which is always slow in making a start, is now only beginning properly to grow; the tallest are about 7 feet, and are now making top shoots of 12 inches. The stems require clearing of the lower branches, not having been pruned since the second season after planting, which is the only form of pruning required by the beech. The side branches are seldom touched.

No. 3 is a plantation of the extent of 8 acres, situated at an altitude of 500 feet above the level of the sea, and was planted between October 1855 and April 1856.

The ground, up to the time of planting it, had evidently lain in a state of nature. It was let to a tenant upon a yearly lease, and considered highly rented at 5s. per acre, as pasturage for cattle.

From the presence of roots in the ground it was evident that oak trees of large dimensions had once grown upon it. Straggling birch and whins were the principal growth on it before planting it. In consequence of the oak timber, when cut down, having been cut very low in the ground, no coppice had come up upon the stools, otherwise a crop of oak coppice might have occupied the ground.

Most part of the ground was sufficiently dry for planting, with a few exceptional wet places. The surface of the ground to about 9 inches deep is a clay loam, in the wet parts resting upon white sand, and on the dry ground resting upon an open gravel containing iron ore.

Preparing for Planting.—The first step taken in the work was to let by contract the cutting of all wood and whins upon the ground, tying them up in the form of fagots for the purpose of burning lime. 2s. 4d. per 100 was paid for cutting the wood and tying up the faggots, and they were sold at 6s. per 100 upon the ground, leaving a clear balance of £5 profit between cutting and selling of the wood.

The next step was to let by contract, paring off the whole surface turf. The conditions were to cut the turf as thin as possible, in order to remove only the thick matted rooty part without impoverishing the soil by carrying off the best of the earthy part. The work of paring, which was performed by means of the flaughter-spade, cost 30s. per acre. A neighbouring farmer carted off the turf after being cut, to form composts with for top-dressing his pasture-land, and by this means no additional expense was incurred.

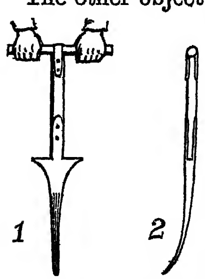
Drainage.—As soon as the ground was cleared of the turf, 2400 yards of draining were staked off and let by contract. The specifications were, 30 inches deep, 30 inches wide at top, and 13 inches wide at bottom; and the earth excavated to be spread equally on each side of the drains not more than 4 inches deep, and at least 18 inches removed back from the sides of the drains, at a cost of 1½d. per lineal yard.

Fencing.—The fence, which was originally a turf dyke, but at present in some places crumbled down to near the level of the ground on each side, was let by contract to be repaired and made up to a height of 6 feet from the bottom of the ditch outside, and a one-bar paling 14 inches high erected on the top, the rails of the paling to be sawn in any convenient lengths from 12 to 18 feet, 3½ inches by 1 inch, and to be supported by posts 4 feet long, 3½ inches by 3½ inches, sharpened and driven into the dyke with a maul;

the rails to be nailed to them with $3\frac{1}{2}$-inch patent flat-point nails; the whole to be completed at a cost of 8d. per yard.

Planting.—The object of planting was with a view to letting it grow till 12 or 14 years of age, and at that period finally to clear the ground of the whole crop of trees; selling it upon the stool on the ground at so much per acre, for hop poles, for which plantation larch of a certain description often realises as high a price as from £60 to £70 per acre. The planting was let by contract at the rate of 5s. 6d. per 1000, "including preparing of the ground by means of the bore-bill." The mode of planting I will give afterwards in detail, as the practice is not generally known in the north, particularly the use and application of the borer or bore-bill, as it is called in Sussex.

The other object of planting is to have, after the first clearing of the wood is made, a perpetual crop of coppice upon the ground ever afterwards. The operator with the borer goes backwards along the stretched line, inserting the tool three times around each—"in effect, making a pit for the plant." Fig. 1 represents the bore-bill in the hands of the operator, in the act of inserting it in the ground. Fig. 2 is a sectional view of the same implement.



There are three times the number of larches planted that there are of ash and chestnut, that each two plants are 24 inches separate from plant to plant, and that the hardwoods, after the larch are all removed, will remain 4 feet apart each way, and these, when they grow up the second and future times in the form of coppice, will remain abundantly thick upon the ground to constitute a crop. There is a great difference in planting for hop-poles from what there is in planting in order to rear trees to timber size: the qualifications of the former are, a tall pole with few side branches, and with nearly equal thickness throughout its length, while those of the latter are nearly quite the reverse of this.

EXPENSE OF ENCLOSING.

To repairing turf dyke and one-bar paling on top, 850 yards, at 8d. per yard,	£28	6	8
Total for enclosing,	£28	6	8

DRAINAGE.

To cutting and spreading earth excavated from drains, 2400 yards, at $1\frac{1}{2}$d. per yard,	£15	0	0
Total for drainage,	£15	0	0

PARING TURF.

To paring surface-turf off 8 ac., at 30s. per ac.,	£12	0	0
Total for paring turf,	£12	0	0

PLANTS, PRICE OF, AND CARRIAGE.

To 65,350 larch plants, 1½ ft., at 12s. per 1000, . . .	£39 4 2½
,, 11,800 ash do., 2½ ft., at 20s. per 1000, . . .	11 16 0
,, 10,000 sweet chestnut do., 2 ft., at 22s. per 1000, . .	11 0 0
,, carriage of plants 2 miles, and sheughing into the ground, .	3 5 0
Total for plants and carriage, . .	£65 5 2½

PLANTING AND BORING.

To planting and preparing ground with the borer, 87,150 at 5s. 6d. per 1000, ...	£23 19 3½
Total for planting, . . .	£23 19 3½

Abstract.

Enclosing, . .	£28 6 8
Draining, . .	15 0 0
Paring turf, . .	12 0 0
Plants and carriage, .	65 5 2½
Planting, . .	23 19 3½
	£144 11 2 ÷ 8 = per acre £18, 1s. 4½d.

The following Table shows the size of the trees when planted, and the average annual growths each class of plants made from the time of planting to the present date, during each year :—

	Size of trees when planted, 1856.	Growth 1856.	Growth 1857.	Growth 1858.	Growth 1859.	Growth 1860.	Growth 1861.	Growth 1862.	Height of plants, 1862.
Larch—	ft.	in.	in.	in.	in.	in.	in.	in.	ft. in.
Class 1st, 33 trees, .	2	3	4	6	8	9	11	12	6 5
,, 2d, 33 ,, .	1½	2	3	4	6	7½	8½	9	4 10
,, 3d, 34 ,, .	1½	1	1½	2	3	3½	4	4	3 1
Ash—									
Class 1st, 33 trees, .	3	2	3	4	5	7	7	9	6 1
,, 2d, 33 ,, .	2½	1½	2	3	3	5	5½	7	4 9
,, 3d, 34 ,, .	1	1	2	2½	3	4	5	5	2 10½
Sweet Chestnut—									
Class 1st, 33 trees, .	2½	2	4	4	5	8	9	10	6 0
,, 2d, 33 ,, .	2	1½	2	3	3	5	6	7	4 3½
,, 3d, 34 ,, .	1½	1	1	2	2	3	4½	5	3 0½

The preceding Table shows in the first column the size of the trees when planted; the next seven columns shows the average growths made in each year; the last column shows the height of the trees at the present time.

Condition of Plantation.—The trees over all the ground are in a very healthy state, and may now be considered fairly started. The larches were small when planted, but as there was no grass or herbage of any kind to obstruct their growth, no evil consequences resulted. The drains have acted well, owing to the sandy nature of

the subsoil, and no deaths occurred except a few of the chestnuts, which died down nearly to the ground; and as these were cut over the second year after planting, no filling up was required,

Remarks.—Plants brought from a low-lying sheltered situation, or from a rich to a poor soil, should always be planted at least one season in a nursery in the immediate neighbourhood of the plantation where they are to be put permanently. Plants of every description should be lifted and transplanted annually, preparatory to finally planting them out into the plantation ground; by this means rankness of growth is prevented, and a greater number of fibres produced upon the roots of the plant than by allowing the plants to stand two or three years without removing them. Plants, till they are sufficiently strong and tall, should be kept clear of long grasses, brakes, whins, &c., as these grow over the young plants, which in a short time induces them to grow bent or crooked; and if in any case a tree grows crooked at the bottom, it never again becomes straight, but is generally bent or crooked to the top. The borer is a most efficient instrument in the hands of an able-bodied man, and can be used with great advantage in preparing the ground for planting. It is not used in excavating the earth so as to form a pit, but merely to break the soil and subsoil to a depth of 2 feet, and by entering it three times around where the plant is to be planted, the soil and subsoil are effectually broken within a circuit of 3½ feet; by using the borer in making pits, or rather a substitute for pits, in place of making pits in the usual way, a saving of about 75 per cent is effected. Black game are very destructive to the Scots pine when below 3 feet in height—they pick out the buds during the winter season, which is in effect cutting off the top shoot of the young plant. Young pine plantations should not be formed where pine timber has been cleared from, till the ground has lain long enough to purify itself, or otherwise rendered fit for planting, by draining, trenching, and liming, or fallowing as a substitute for liming, which is better for the growth of the trees.

BRAXY IN SHEEP.

By William Robertson, Erray, Tobermory.

[Premium—The Gold Medal.]

It is somewhat curious that a disease which inflicts so serious a loss on the sheep-farmers in most parts of the Highlands of Scotland as *braxy*, should have remained so long uninvestigated by professional and scientific veterinarians. It is almost ludicrous to see the cursory manner in which it is mentioned in books that treat of the farm, and the way the disease is accounted for. The general opinion seems to be, that it is brought on by the sheep being compelled in snow-storms to eat the top of heather, which causes a constipated state of the bowels and inflammation. This easy solution seems to have been adopted without its accuracy being tested. For my part I have seldom seen much braxy while snow lay on the ground. As might be expected, from so little inquiry being made as to its origin, the nature and cause of the disease are little understood. It is to be hoped that the premium offered by the Highland Society may call forth the views and opinions of professional men on the subject. I can only bring zeal to the cause, and sad experience, to bear upon it.

In a matter that has attracted so little attention, it may be necessary to give some idea of the loss it has entailed on the sheep-farmer of the Highlands for many years. From extensive inquiries, I have learned that in many districts there are few that lose less than 25 per cent of their hoggs from braxy in a few months every year. Three years ago I lost 40 per cent of mine; and a neighbour told me that last year his loss amounted to two-thirds of his whole hoggs. But to be within the mark I will take 20 per cent as the average loss, and see what it amounts to in money in an average stock. It must be borne in mind that a wintering is provided for the gross number, and that no stock takes the place on it of those that die. The hoggs that die would have been worth 20s. in May. They may be replaced on the average for something like that sum so far as first cost goes, but to this must be added the expense of taking home; and it is well known that, even were it possible to get ewe hoggs of a quality equal to those that died, they would not thrive on the ground like those bred upon it, and a considerable loss would arise from their straying, which sheep brought to strange pasture seldom fail to do. This, along with the loss on the wintering, would raise the gross loss to at least 22s. 6d. on each hogg that died, after deducting the price of the braxy mutton and skins,* or £22, 10s. on

* In some places braxy carcases are of considerable value early in the season —as much as 5s., including the skin; but later, the animal becomes emaciated, and

the 100 hoggs, at the same time that it would be next to impossible to make the well-bred even stock that every good stock-farmer aims at. Or take the alternative, and keep only a stock made up of those that live, and, in the course of a few years, scarcely an animal can be sold without reducing the farm to an understock.*

Take another view of it:—In five years braxy carries off a number equal to the whole hoggs produced in one year on the farm.

Take another still:—Braxy carries off every year nearly as many as can be sold yearly off the farm; and be it remembered that this is not a mere temporary evil that may be expected to pass away—it is the normal state of matters from which sheep-farmers have been suffering year after year for generations. The subject, then, is one of vital importance, and a remedy to the evil the greatest boon the sheep-farmer can receive.

Having shown the immense loss it entails, I will now proceed to consider the nature of the disease called braxy.

I am acquainted with three kinds of it:—

1*st*, The most common is that where the animal becomes much swollen even before death, and, on being cut up, emits a strong smell, very offensive and sickening to those not accustomed to it. This is the real braxy.

2*d*, The red braxy, so called from the blood vessels under the skin being much inflamed, giving the carcass the appearance of a mass of red putrid flesh; and,

3*d*, Where there is no swelling during the progress of the disease, and the noxious gases that cause the peculiar smell of the first kind mentioned are almost entirely absent.

These arise from different causes, or perhaps from the same causes, with considerable modifications, and are of the nature of violent inflammation.

The flesh of sheep dying of braxy is a favourite article of diet with many, and I have conversed with those who prefer it to the best killed mutton as more wholesome and easier of digestion. One man told me that it is the only kind of animal food he can take with impunity. This is, I presume, an acquired taste, similar to that of the epicure for game in a state of decomposition. It is not at all improbable that a refined gentleman would eat grouse with the utmost relish that a sturdy labourer would turn from in disgust. Red braxy is unfit for human food, being soft and putrid from the time the animal is dead. Aged sheep are more liable to it than to the others.

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in wide ranges, and where, as is often the case, there is not a careful person in charge, it may be dead for several days before it is found, and torn to pieces by dogs and vermin, which reduces the average value to something almost nominal.

* In certain districts the loss from this disease may be quite as great as here related, but over the Highlands the per centage is far less, and on the whole it is decreasing.—Ed.

The symptoms of the disease are easily described, but, from the rapid course of it, the premonitory symptoms, if there are any, are little known. The first usually observed is the hogg lying down frequently when the rest are grazing. It never eats, and there is a restlessness and occasional change of position, with a dull, sick look. The head hangs down, the eye becomes glazed, and there is sometimes a rapid movement of the hind feet, and a crunching noise with the teeth, indicative of pain. The paunch begins to swell, and the back rises; then the animal crawls away from the rest and lies down, but often rises and changes its position. This it continues to do until moving becomes so painful that it ceases to rise, and lays its head on the ground—a sad picture of patient, silent suffering. It allows itself to be caught, and makes but faint efforts to get free, then drops down, and makes no farther attempt to get away. The swelling increases, and so does the agony of the animal, which is extreme, till death comes to its relief. There is frequently froth, mixed with blood, in the mouth and nostrils.

I have examined the intestines of a good many hoggs that died of braxy, and the appearances varied. In common braxy I found the manyplies, or third stomach, full of indigested food, which had become hard and compressed, so that, when cut with a knife, it broke down, dry, between the finger and thumb. This apparently caused a complete stoppage in the bowels, and obstructed the functions of the digestive organs, and inflammation of the most violent nature was the result. The inflammation seemed to have begun in the manyplies and fourth stomach (red-bag), and spread in all directions to the first and second stomachs, the inner coating of the first coming separate in large sheets or patches—to the small intestines, and to the liver and gall-bladder. The liver, in whole or in part—but always in the neighbourhood of the gall-bladder—is in a state of decomposition, and comes to pieces with the slightest touch. The cavity of the body is often full of water tinged with blood, there being as much as a pint or two sometimes. The state of these organs show clearly the hopelessness of any attempt to overcome the disease, once that it comes to a head, by giving medicine. For some time I did give medicine, and where the animal was observed at an early stage of the disease I imagined with some success. What I gave was a strong dose of Epsom salts in warm gruel, with a little ground ginger. I remember a fine tup hogg that was so affected that my shepherd said its breath smelled of braxy, being cured by this dose. But much good cannot be done by medical treatment after the disease has made perceptible progress. We must look for a preventive, not a cure. In red braxy appearances were much the same to a superficial observer, and as regards the examination of the intestines I do not profess to be anything more. In the third modification of the disease the intestinal symptoms are somewhat different. There is considerable in-

flammation of the bowels, especially in the region of the liver and contiguous organs; but the manyplies is not so hard or full as in the other cases, and the bowels are partly soft, with occasional hard lumps. I have seen a hair-ball in the fourth stomach, which was much inflamed.

There is reason to believe that sheep, until they arrive at about a year old, are delicate in constitution, and easily affected by sudden atmospheric changes, and relative changes in the pasture they feed upon. In summer, when the grass is growing and full of succulence, and while lambs are sucking their dams, they are liable to few or no diseases, except during a tract of dry weather, when, if the pasture be of a hard dry quality, the ewes fall off in their milk, and the lambs take to eating the dry indigestible grass, which frequently brings on a disease known by the name (local, probably) of "Trembles," and, like braxy, it is caused by obstruction in the bowels, and sometimes the joints of the animal become affected, so that it can scarcely stand or walk, and trembles all over, showing a powerful nervous influence. Sheep of all ages are liable to this complaint, which, however, is not so fatal as braxy, and aged sheep are most subject to it in spring when weak, and before the system has recovered from the hardships of winter.

It would thus appear that all sheep are liable to disease arising from derangement of the digestive organs, particularly when in a weak state, and the question for consideration here is, how sheep under a year old, which are peculiarly so from the middle of September to January—that being the braxy season—are to be treated so as to prevent what I believe to be inherent delicacy of constitution, and weakness of the digestive organs, from resulting in braxy.

Of all animals, perhaps sheep are the least studied in reference to the requirements of nature, at the time of depriving them of the mother's milk. Every other domestic animal gets either artificial feeding, or pasture of greater succulence than they have been accustomed to, but lambs are turned to a corner of the hill in almost every instance, and for a few days are hunted about, and allowed little time to feed on pasture which, in nine cases out of ten, is wholly unsuitable; then they are usually let among the ewes again —the process of spaening being held to have been accomplished— to thrive if they can upon the pasture they had when sucking their dams. It is thought that, from the time they are spaened, lambs thus treated begin to contract the germs of braxy. They live, and apparently thrive, for a month or six weeks after, and then die by the dozen. A large quantity of grass, which begins to ripen and lose its succulence by the middle or end of August, and becomes less easily digested, is taken into the stomach. The digestive organs, naturally delicate, are overtaxed, an accumulation of undigested food takes place, and braxy results as soon as the animal is chilled by a night of hoar frost, a few days of cold wind and rain, or the system

receives a shock by the application of tar and butter, or other powerful dressing.*

Such I conceive to be the origin of the common braxy first mentioned, and the less common red braxy; but the other, and in some instances the most fatal of all, arises generally from a different cause—viz., from the hoggs being kept too long on the same pasture until it becomes foul. It follows that three things are to be avoided to afford a chance of preventing braxy—

1*st*, Hard, rank, indigestible pasture at the time of spaening and afterwards.†

2*d*, Exposure while in such pasture to sudden and violent changes in the weather; and,

3*d*, Keeping hoggs on one run of grass until it becomes foul.

One or two more might perhaps be added, such as pasture foul with weeds, and young clover. On the latter, I have seen hoggs die in great numbers, and afterwards, a short time having been given to them on different pasture, I have seen them live and thrive remarkably well upon being taken back to it.

This reduces the question to very narrow limits, and the remedy seems plain, and is comprised in a few words. *Wholesome succulent food* and *shelter*. There is certainly no new discovery here, yet few there are that attend to these requisites.

How can this be best done?

Many Highland farms consist of part arable and part hill pasture. This forms a system which offers a peculiarly favourable opportunity for the proper management of sheep stock, inasmuch as it enables the farmer to have both turnips and sown grasses for his hoggs. One or other is very necessary to the proper management and rearing of hoggs, unless oilcake, which will be immediately adverted to, and which I think well adapted to farms where these cannot be commanded, supersedes them, or rather is found to be a valuable substitute. But many have given both turnips and sown grasses without the success that might be expected, probably for reasons that may be gathered from a narrative of the manner in which turnips are given. This is usually done by turning the hoggs into the turnip-field when braxy begins, and allowing them for a few days to take the run of it. They at once begin to eat the weeds, and shortly after the tops. This brings things to a head. Braxy begins in earnest, and causes such an alarm, that the hoggs are frequently turned to the hill, and allowed to take their chance. When this stage is past they are folded, and allowed a certain time daily on

* Where braxy is very common early in the season, the lambs should not be weaned till they are sent to the wintering. Smearing is often thought to aggravate the tendency to this disease, but this probably arises from the hoggs being confined to small fields, and the grass becomes foul.—Ed.

† By this is not meant good sound, but coarse muirland pasture, on which hoggs may live and thrive well if the winter be open, and they are not overcrowded, although unsuitable at the time of weaning.

the turnips, and then turned to the pasture till next day. The error here is manifest. By the time the hoggs are given turnips, braxy has commenced; the disease has got into the system; a large accumulation of indigestible grass is in the stomach; and food of the bulk and succulence of turnip-tops ferments, and causes a derangement of the system that brings on violent inflammation immediately.

After the manner of my neighbours I so treated my hoggs for some years, and like them lost heavily; but not quite so much so as afterwards when I ceased giving turnips, which I did from the impression that it did not keep them alive so as to pay the expense of the practice. I am still inclined to this opinion, except where they are used as a means for reclaiming land. For completing the work of reclamation nothing can be more adapted on a Highland farm than a turnip crop eat off by hoggs; but I question whether it will pay the farmer to grow turnips on land in a high state of cultivation, and for which he pays a high rent, for wintering hoggs merely.

Last year, 1861–62, I tried the experiment, and the result was not satisfactory. The hoggs, though regularly folded for several hours daily, took nearly a month before they made much progress in eating the turnips. Many of them died of braxy in the mean time, and the weather becoming wet, they got *draggled* and fell off in condition. I am satisfied, however, that turnips, when timeously given, will prevent braxy to a certain extent, but not altogether. The hoggs thrive well upon them, and I have seen no bad after-results, except, perhaps, a few cases of sturdy.

The quantity of turnip a hogg requires is difficult to calculate. A gentleman of large experience, and one of the most successful rearers of stock in Scotland, told me that his allowance was an imperial acre to thirty hoggs; but I think few give so liberally, and perhaps forty might be assumed as a fair average to an acre. This, over and above the pasture they would require, would make the wintering of hoggs, on a considerable Highland farm, rather expensive.*

Sown grasses,—by which I mean fields that have been well manured and limed, and for some time sown down, and aftermath of clover hay,—I think better adapted for hoggs than turnips. It has as good an effect in preventing braxy, and they eat it at once. It is necessary, however, to have two runs of it to allow of the hoggs being shifted every ten days or a fortnight, otherwise braxy will ensue.†

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* To prevent braxy, the hoggs would require to be accustomed to eat turnips before the usual season for the disease appearing arrives. This is a most expensive system, however, and in Highland districts turnips are not to be had.—Ed.

† One or two of my neighbours sowed rape along with grass-seeds for ewes and lambs, to prepare them for the fat market last season, and from the appearance their fields presented, I should imagine them peculiarly suited for hoggs during the braxy months; and I mean to try what can be done with this kind of mixture as soon as I can make the necessary arrangements. It appears to combine, to some

I have also tried housing my hoggs at night, giving them first sheaf corn, then hay. But I had too many for the accommodation I could command, and the experiment was not successful. I have still, however, considerable faith in housing them,—only it requires so much accommodation that it can be done by few, and on a small scale.*

But it is not always possible or profitable for the farmer to give either turnip or sown grasses to his hoggs, and in that event how are the ravages of braxy to be prevented? On that question I will merely narrate my practice for some years back.

Having found turnips, sown grasses, and housing not to answer the purpose of preserving my hoggs from braxy, I considered that some auxiliary food likely to strengthen the constitution of the animal, at the same time that it improved the condition and promoted the free and healthy action of the digestive organs, my best chance of saving them, and determined with as little delay as possible to give oil-cake. This was in 1859–60. I was led to anticipate difficulties in getting them to eat it, and was glad soon to see that these had been greatly exaggerated. An enclosure was made with hurdles, in which they were confined for ten days, getting a run out daily for an hour or two to prevent them being too much reduced by starving. By the end of this time many ate the cake readily, but braxy carried off ten of them during the first three or four days they were confined. Upon this I was advised to let them to the hill to take their chance; but having determined to give the experiment a fair trial, I persevered. The following week one or two died, then the disease ceased; but, unfortunately, I ran out of oil-cake, and the hoggs were three days without getting any, and the last of these days braxy carried off three of them. For ten days afterwards they got cake regularly, and I lost none. The hoggs were all this time on the aftermath of the hay fields, which were becoming foul, as they were there now day and night, and in a week three more died notwithstanding that they were getting cake regularly. This showed me that change of pasture had become necessary, and the hoggs were at once turned out upon low hill pasture at night, and put on young clover, rough and clean, during the day. The effect was immediate. The progress of the disease was again arrested, and week after week passed until the braxy season was over without another death among my

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extent, the advantages of turnips and sown grasses, and is certainly worth the consideration of those who have hoggs to rear.

* A farmer occupying a fertile island off the west coast told me recently, that however fatal braxy is among his sheep, whenever he houses them it ceases; and so satisfied is he that this will preserve them from the ravages of the disease, that he has gone to very considerable expense in erecting sheds large enough to accommodate the whole of his fine flock of hoggs. I did not find the effects of housing so favourable, but often saw of a morning two or three hoggs carried home that had died over night in the house.

hoggs, a circumstance as rare as it was pleasant in my experience of wintering them. By the end of December or beginning of January, I began gradually to withdraw the cake, giving it only once in the two days, then once in the three, until the end of January, when they ceased getting it altogether—the wintering being so good, I did not think it necessary to continue it after the braxy season was over. They got it for a period of three months, but they got the full daily allowance for only part of that time. The rest they were learning to eat it when very little was put in the troughs, or getting it once in the two or three days. When on full allowance, the quantity given daily was two ounces to every hogg in the flock, and the cost during the season amounted to about 9d. a-head. In that time I lost from all causes about one and a half in the score or 7½ per cent.

It is possible, if the hoggs had got the cake a month earlier—that is, a month before braxy manifested itself, so as to have been on full allowance when it usually makes its appearance, that the loss sustained during the time they were learning to eat or acquiring a taste for it, would have been at least partly avoided. It was certainly a mistake to have left them so long in the worst of the braxy season without change of pasture, rendered necessary by what they were on becoming foul. Some will feel disposed to add another mistake, and say I should have given the cake more liberally. That may be true, and I recommend those who think so to avoid the error themselves. But the allowance was not so small as at first sight it appears, for a number of the hoggs did not and could not be got to eat cake, and those that did had the share of those that did not, along with their own. Moreover, the experiment would not have been of so much practical utility if a large quantity had been given, which might deter many from giving cake, owing to the expense, or at all events, make the expense appear a much more formidable matter than it actually need be. Wooden troughs and hurdles are the only extra expense, and where the "fank" or fold is conveniently placed, the expense of the hurdles could be avoided.

After I had withdrawn the cake, the winter became very boisterous and inclement in this district, and about 20 inches of rain fell in two months. In March I thought the hoggs looked drenched and worn down in consequence, and this led me to carry still farther the oilcake experiment, by resuming to give it occasionally throughout the spring, and the benefit was marked. Indeed, I consider this to have been one of the most satisfactory results attending the experiment, as it enabled me to keep up their condition until the grass began to show. Further, I think the benefit does not even end after all risk from braxy is over, but may be felt in any after year, when the sheep, if reduced by a bad winter and spring, can be helped through by giving them cake, which they will always eat after having once acquired a taste for it. Cake has this advantage

over turnips,—it can be had at any time, and all the year round, and the expense of it is comparatively trifling.

I was so well satisfied with the results obtained, that I tried oilcake the following year, and with some success. I had turnips on newly reclaimed land which it was necessary to eat off, and it may be partly owing to this that the hoggs stood pretty well. But the result, from giving both oilcake and turnip, was not so satisfactory as from the oilcake alone, probably because the sheep lost time in learning to eat the one first and then the other. My tup hoggs got oilcake alone, and out of fifteen I lost only one.

I am well aware that many will object to giving oilcake to their hoggs, owing to the difficulty of giving it to great numbers together; others will object on the ground that they cannot keep their hoggs separate from the other sheep, and that it would be hopeless to attempt to gather and separate them daily in order to be fed.

There would be no great difficulty in giving cake, if the number getting it at one place did not exceed 500 or 600; and I consider that if enough of troughs are judiciously placed, it does not add much to the difficulty though the number be larger. Each score should have a trough broad enough to be eaten out of from both sides at the same time, and 9 feet long—the quantity of cake just enough to spread over the troughs; and I would recommend it at first to be mixed with rough oats, and afterwards with a few turnips finely sliced, and a handful of salt.

The difficulty of keeping the hoggs separate may be serious on an ill-fenced farm, and it is impossible to give directions in reference to it suited to all farms. I would merely urge upon farmers to consider each his own peculiar case, and to go to work, determined to overcome all difficulties; and I think I may safely say, as regards fences, that he will find the result so satisfactory as to justify the use of all necessary means. It is bad management, under all circumstances, to winter hoggs among other sheep, and every stockholder of skill will devise some way to avoid doing so.

The conclusions I have arrived at are not altogether satisfactory. They are shortly as follows:—

1*st*. That sown grasses and turnips, when timeously given, are preventatives of braxy.

2*d*. That oilcake has the same effect at less expense.

3*d*. That none of these is altogether a preventive.

It would thus appear that something is still wanting. Some searching and stimulating medicine, given before braxy manifests itself, and occasionally during the months of October, November, and December, to prevent the accumulation in the manyplies, might obviate the formation of the disease altogether. I have no knowledge of medicine, and cannot test the correctness of this theory; but I shall be very happy if any one that has will take the trouble to inform me what is most suitable for the purpose, to try an expe-

riment, and to communicate the result for the benefit of those who, like myself, have suffered heavy losses from the ravages of braxy.

I am well aware that different and more favourable results may have been obtained in other places; but in this district, which may be considered the stronghold of the disease, I cannot arrive at any other conclusion than that turnip, sown grasses, and oilcake are not specific against it. I have no doubt that locality and climate have much to do with it; for places where noxious weeds pervade the pasture, as is generally the case in land formerly in cultivation, and cropped till nothing else would grow, and where frequent and sudden violent atmospheric changes take place, are naturally favourable to the production of inflammatory diseases, and braxy is the shape these assume in young sheep. In localities where the producing causes are less powerful, they will be less malignant, and more under the influence of remedial treatment, and it is not at all improbable that the experiments that were but partially successful here, would have been wholly so in other places. I do not mean not to give turnip, or sown grasses, or oilcake to my hoggs, because I have not found any of them specific against braxy. I have found them all partial preventives, and I will consequently give one or other of them until a remedy is discovered so effective as to reach the disease in its most malignant form.

REPORT OF PROCEEDINGS IN THE EDINBURGH VETERINARY COLLEGE.

By Professor Dick.

Summary of Cases, comprising Diseases, Injuries, &c., amongst Domesticated Animals, registered in the Clinical Transactions of the Edinburgh Veterinary College, which have been under treatment during the months of April, May, and June 1863.

	Horses.	Cattle.	Dogs, &c.
Abscesses in various parts,	9	...	...
Bones, diseases and injuries of,	9	...	...
,, fractures of,	7	...	...
Brain, diseases of,	...	...	2
Broken knees,	5	...	...
Bursæ, distension of, with lameness,	3	...	...
Castration,	8	...	...
Catarrh and sore throat,	40	...	3
Chorea,	...	...	1
Colic,	41	...	...
Constipation (obstinate),	2	...	2
Cracked heels,	7	...	...
Curbs, with lameness,	7	...	...

	Horses.	Cattle.	Dogs, &c.
Debility,	1	...	...
Diabetes,	3	...	...
Diarrhœa,	4	...	...
Distemper,	...	...	14
Docking,	1	...	...
Epistaxis (bleeding from nose),	2	...	...
Enterites,	1	...	1
Esophagus, dilatation of,	1	...	...
Examinations as to soundness,	52	...	...
Eyes, diseases, &c., of,	11	2	7
Fistulæ and Sinuses,	2	...	...
Farcy,	1	...	...
Feet, corns in, with lameness,	3	...	...
„ canker in,	3	...	...
„ inflammation in,	7	...	...
„ navicular disease in,	45	...	...
„ pricks in,	3	...	...
„ pumiced,	3	...	...
„ quittors in,	2	...	...
„ sandcracks in,	9	...	...
„ seedy toe in,	1	...	...
„ side-bones,	5	...	...
„ thrushes in,	2	...	...
„ wounds and bruises in,	23	...	...
Glanders,	1	...	...
Gastritis,	...	...	2
Grease,	4	...	...
Hair balls,	...	1	...
Hæmatemesis (vomiting blood),	...	...	1
Hæmoptysis,	1	...	...
Hernia, ventral,	1	...	...
Hoof, casting off,	1	...	...
Indigestion,	4	1	...
Influenza,	14	...	...
Lameness, elbow,	2	...	...
„ fetlock,	13	...	...
„ hip,	16	...	...
„ hock,	6	...	...
„ knee,	3	...	...
„ pastern,	2	...	...
„ shoulder,	2	...	...
„ stifle,	5	...	...
Mange,	4	...	3
Nettlerash,	4	...	...
Open joint,	2	...	...
Over-exertion,	3	...	...
Paralysis,	1	...	2
Parturient fever,	...	2	...
Parturition, difficult,	1	...	1
Pleurisy, &c.,	2	1	...
Pleura Pneumonia,	...	2	...
Poll-evil,	1	...	...
Poisoning,	...	...	2
Rectum and vagina, injury of,	1	...	...

	Horses.	Cattle.	Dogs, &c.
Rheumatism,	2	...	...
Ringbones, with lameness,	1	...	...
Roaring, thick and broken wind,	8	...	...
Sore backs,	2	...	...
„ shoulders,	3	...	...
Scalded sheath,	1	...	...
Spavin, with lameness,	21	...	...
Spermatic Cord, thickening of,	1	...	...
Splints, with lameness,	4	...	...
Sprains, muscles,	7	2	1
„ tendons, ligaments, &c.,	31	...	...
Stomach, rupture of,	2	...	...
Strangles,	11	...	...
Stringhalt,	2	...	...
Surfeit (eczema),	1	...	...
Teeth, diseases, &c. of,	2	...	...
Tetanus,	2	...	...
Thoropin,	1	...	...
Treads,	1	...	...
Tumours, various,	4	1	...
Weed,	11	...	...
Worms, intestinal,	1	...	3
Wounds and bruises, other than feet,	32	1	1

General Abstract.

Cases amongst horses,	568
„ „ cattle,	13
„ „ dogs, &c.,	46
Total,	627
Not included in above, Llama, Paralysis,	1
	628

The most striking fact established by the preceding summary, is the great increase which, it will be seen, has taken place in the number of cases of disease affecting the organs of digestion. During the quarter ending 30th June, it appears that upwards of 60 cases, depending either directly or indirectly upon derangement of the digestive organs, have come under treatment, of which number not fewer than 41 were cases of colic or gripes. The great majority of these occurred amongst farm and draught horses. Colic is well known to be a disorder almost entirely occasioned by irregularity in feeding and accompanying mismanagement; and that it should be found to prevail to such an extent among our work horses indicates, in my opinion, a want of superintendence and attention, as well as neglect of duty, by no means creditable to those intrusted with their charge. That carelessness, or mismanagement, or both combined, is the chief cause of this disorder, is no longer a matter of doubt, but, on the contrary, is well known, and very generally acknowledged. Take, for instance, the case of

a farm horse. How common an occurrence it is to find this class of horses attacked with colic on a Monday; in fact, how rarely do we find them attacked with it, excepting on a Monday; and why? The explanation is very simple. Sunday being a day of rest, the horse is confined to the stable, during the whole day from Saturday night to Monday morning, a period of about 36 hours. The driver, partly through mistaken kindness, and partly to save himself labour, keeps the rack full, and the animal's whole occupation is to empty it; and cramming into his stomach food beyond satiety, he greatly overfeeds himself. As a consequence, on Monday when put to work, his bowels, overburdened with a quantity of crude and half-digested condiment, have their functions arrested, the mucous membrane lining them becomes irritated, and the natural result is violent contractions of the muscular coat, producing the too well-known spasmodic pains. The natural process of digestion being thus arrested, the food undergoes a process of fermentation; gas is evolved, and we have distension. The question next arises, How is the increase of such cases during the spring and early summer months to be accounted for? It may be thus solved. During winter, cart and farm-horses are fed chiefly on hay and straw, or dry chopped food; but these articles of food in the latter end of spring and beginning of summer becoming scarce, their use is substituted by succulent grasses. Now nothing tends so much to cause indigestion and consequent colic, as a sudden change of food to which the stomach has not been accustomed, more particularly when the change is from a dry one to one of a soft juicy nature; the latter being more palatable, the animal eats rapidly and ravenously, and thus overloads his stomach and bowels. Much has been said and written about the treatment of colic, and many plans of treatment have been recommended; but in my practice I have found nothing better than the administration of a draught composed of linseed oil, laudanum, and some stimulant. And as regards stimulants, I find that the best are those which are generally at hand, or most readily procured—viz., turpentine, whisky, or ether. I certainly prefer, and almost invariably use, turpentine, simply because it is the cheapest, and I find it answers all the purposes required. In addition to the draught, I always follow up its administration with repeated glysters of warm water and soap, and, where there is evident constipation, a dose of aloes. I think it generally advisable to give a laxative, to prevent any tendency the opium might have to bring on constipation. In addition to medicine and glysters, hand-rubbing the abdomen will be advantageous, with slow walking-exercise at intervals.* In many cases, more especially those of simple flatulent

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* In bad cases I have found great benefits resulting from the repeated application of hot water or stimulants to the surfaces.

colic, I have found that exercise was all that was necessary to relieve the animal. As a preventive of colic, I would strongly urge upon horse-owners the necessity of regular feeding, and during Sundays, or other rest days, a decrease instead of an increase in the quantity. I would also suggest, during these days, an hour or two's gentle exercise during the middle of the day, or the turning out of the animals for a short time into a convenient paddock or park where there is little grass.

The two cases of rupture of the stomach which are reported, were both brought on as consequences resulting from an attack of colic, caused by engorgement of the stomach with food. One occurred on the 27th of April, in a bay mare, the property of a farmer a few miles from the city; the other on the 1st of June, in a horse belonging to a carter in town. On being called in, the symptoms which presented themselves, in both cases, were strongly marked—viz., quick feeble pulse, rapid breathing, tremors, cold sweats, an anxious look, symptoms which, in addition to excessive nausea and vomiting, while the animal assumes the posture of a dog, sitting upon his haunches, are peculiarly diagnostic of rupture of some internal organ. Both cases, as might be expected, rapidly proved fatal. The case of dilatation of the esophagus occurred in a horse brought to the yard for examination as to soundness. A large swelling was noticed about the middle of the neck on the near side, which, on examination, I discovered to be a dilatation in the esophagus or gullet. The animal was also found to be a roarer, the roaring being, no doubt, occasioned by this large pouch pressing upon and distorting the windpipe. I regret not being able to give the subsequent history of this case, the horse not having come under treatment, being solely brought to be examined as to soundness. In analogous cases, by careful examination, the nature of the affection cannot be mistaken, although at times it is difficult to determine the exact situation of the pouch. In a cow which some time previously came under treatment, the following symptoms presented themselves. She was in very low condition, hide-bound, hair hard and dry, bowels very irregular, and she was subject to frequent fits of choking, followed by vomition, the food being forcibly ejected through both nose and mouth. During the choking-fits, she showed all the well-known signs accompanying this accident—great restlessness, rapid breathing, foaming at the mouth, and grinding of the teeth. In these cases, I find the best and safest plan of treatment is to feed on sloppy and easily-digested articles of food, and these given in small quantities at a time, and at frequent intervals. These pouches, I have no doubt, are caused by, and arise from, in the first place, a stricture in an inferior portion of the gullet, above which the food accumulating gradually, distension or dilatation of the tube becomes a necessary result in a longer or shorter period of time. These

pouches may form at any part of the gullet, but most frequently they are found towards its termination in the stomach, where they can only be detected, or rather diagnosed, by the above symptoms. When they form in the neck I have found the use of a pad or truss, applied with gentle pressure, to be of great service. The greatest care is necessary in not placing before the animal too much food at a time, and especially avoiding giving it any dry food, as they are generally greedy feeders. Where stricture prevails without dilatation, I have found, by the occasional introduction of the probang, that I have been able to afford great relief by reducing the stricture.

The only other cases of diseases arising from derangement of the organs of digestion in the horse which claim attention, are those of nettlerash, *Urticaria*. This disease, although an affection of the skin, is, without doubt, due primarily to imperfect digestion. The symptoms are wheals or blotches, varying in size from that of a bean to a walnut, upon the skin, which blotches always make their appearance suddenly. They are generally most abundant about the neck and shoulders, though scattered over the whole body. I have seldom found the affection accompanied with any constitutional disturbance. A dose of laxative medicine, with a little change of food, being all that is required to effect a cure.

One case of surfeit, *Eczema*, came under treatment towards the end of June, and like the former disease arises partly from derangement of the organs of digestion. It may be distinguished from nettlerash, by the eruption appearing in small vesicles instead of blotches, which are mostly found in clusters. The vesicles soon burst and scab over, the scabs eventually dropping off, and with them the hair, leaving small bare patches, which give the skin an unsightly appearance. It is accompanied with intolerable itching, which may be relieved by fomentation with warm water or the application of a solution of the acetate of zinc. The administration of a laxative, followed up by alteratives, is all that is required in the majority of cases. I would advise the animal's head to be tied up, so as to prevent him getting at the parts affected with his teeth, which the excessive irritation inclines him to do.

A great diminution, it will be observed, has taken place during the three months of the quarter which this report embraces, in the number of cases of diseases affecting the respiratory organs, the decrease, no doubt, occasioned in a great measure by the mild state of the weather. The mildness of the affection was also not less remarkable, the majority of the cases which came under treatment being chiefly attacks of simple catarrh, accompanied in some instances with laryngitis and sore throat. The general treatment required was, the free admission of good air, steaming the head, administering a gentle laxative, and following these up with laxative food and careful nursing. If accompanied with sore throat

and cough, the application of a mild blister to the throat, and the solution of a little saltpetre daily in the water, which ought to be chilled, was all that was necessary in the majority of cases to put the animal all right.

During the quarter three cases occurred in connection with the air passages, which deserve more than passing notice. The first was a case of hæmorrhage from the lungs, *Hæmoptysis*. It occurred in a chestnut horse belonging to a gentleman farmer in the neighbourhood. On the 7th of April the owner's son brought the horse to the yard, stating that he had driven him up from Musselburgh at a quick pace, but not over fast. "I noticed," he said, "nothing amiss with the animal, for he started on the journey in perfect health, and continued so, until near the city, when I observed he suddenly began to fag, and to perspire freely, and in a short time he staggered as if blown. He then commenced to cough, and with the cough considerable quantities of blood were thrown up." The gentleman naturally feeling alarmed, brought the horse directly to the college yard for advice. On his arrival, the horse, which was apparently in good condition, presented the following symptoms, the pulse quick, the breathing hurried, the extremities cold, and the body covered with diffused perspiration. He was seized with frequent and violent fits of coughing and snorting, during which blood was ejected from both nostrils in considerable quantities. The blood was of a bright arterial colour, very frothy, and mixed with mucus. After examination by auscultation and percussion, I was satisfied the blood came from the lungs, and ordered him to be put in a loose box, to have plenty of cool fresh air, to be well clothed, and to have cold water dashed frequently against the breast and sides. I prescribed cold water as his drink, and, when not drinking, I ordered his head to be tied up. This plan of treatment was rigidly persevered in for some time, and I am happy to say with the desired effect, for on the following day he was sufficiently recovered to be enabled to return to his own stable. On leaving I gave strict injunctions to the man to lead him slowly, and in the gentlest way, home; that he be kept strictly quiet for some days; and that his food should consist of cold bran mashes, and cold water for drink.

The other two cases referred to, were examples of hæmorrhage from the nose, *Epistaxis*. The one occurred on the 18th of April, in a bay horse belonging to a railway carrier in town; the other on the 16th of June, in a chestnut horse, the property of a cab proprietor. In both cases the bleeding proceeded from one nostril only, and when first brought to the yard, the blood came away in a continuous stream; but before long it began to collect and coagulate within the nostril. The collection in the nasal chamber, irritating the lining membrane, caused the animal to snort, when the collected blood was thrown out in clots. In neither case could the

driver account for the lesion; but in my opinion it had been occasioned by excessive collar work in both cases, as the one horse had been employed dragging a heavily loaded cart, the other a cab also laden up hill. The same mode of treatment was adopted in each case—viz., perfect rest, and the continual application of cold water to the head and sides of the face, which proved quite successful in arresting the flow of blood. Some authors recommend blood-letting in such cases of accidental hæmorrhage; but in none of these three did I think it advisable, as I considered that all of the animals had lost sufficient blood before they came under my treatment. I am happy to say that in none has there been any return of hæmorrhage.

Seven cases of fractures of bone were registered during the quarter—viz., one of the Os Suffraginis, or pastern-bone, on the 10th of April; one of the Os Metatarsi, or shank bone, on the 23d of April; one of the Ulnar portion of the Os Brachii, elbow bone, on the 3d June; one of the Os Coronæ, or coronet bone, on the 19th of June; one of the Pelvis, or haunch bone, on the 24th of June; a second case of fracture of the Os Suffraginis, also on the 24th of June, and a second one of the Pelvis on the 25th of June. It will be seen that out of the 7 cases 3 occurred within a period of 24 hours, and to these I would claim a few moments' attention. The case of fracture of the Os Suffraginis occurred in a large Clydesdale horse belonging to a railway carrier in town. He had been bought a few days previous to the accident, and was tried, on the morning it happened, in harness by them for the first time. The man stated that they had yoked the horse to an empty cart in their own yard, and in taking him out in the street he made a sort of stumble, from which he immediately recovered, but on his again moving forward, he was found to be dead lame. I was immediately sent for, and went accompanied by the owner's shoeing-smith, who had previously seen him, and diagnosed it to be a case of fracture. On my arrival I proceeded to examine the leg, and found, as stated, the pastern-bone to be broken. I ordered the hair to be clipped off the part, a plaster bandage to be tightly rolled round between the foot and the fetlock joint, and the animal to be placed in a loose box. Considering the great weight of the horse, I deemed it advisable to sling him. The case progressed for several days, when he was attacked with congestion of the lungs, which, running on to inflammation, speedily carried him off. On making a post-mortem examination, the pastern-bone was found broken: it was obliquely fractured from above downwards and outwards. This is the usual form of fracture of the pastern which I have met with in practice. Several similar specimens to the above, collected by me, are to be found in the College Museum.

The cases of fractures of the pelvis occurred—one in a bay horse belonging to a cab proprietor, the other in a bay mare be-

longing to a coal merchant at the Canal Basin. Such osseous injuries are far from uncommon; and in the majority of instances, as in the present cases, are caused either by the animals slipping while drawing heavy loads up some of our steep and by no means well paved streets, or during some sudden and unexpected exertion. In fractures of these kinds, I find that rest, the avoidance of all unnecessary motion, along with patience, are the best means of cure. A popular error prevails, that the extremities of fractured bones in the horse do not readily unite, but, so far as my own experience enables me to pronounce an opinion, I have found the reverse to be the case, and that fractures in the horse reunite much more rapidly than in any other quadruped, and even than in man. Our only, and I allow it is a great, difficulty, is to keep the poor animal at rest. In cases of the pelvis I order the animal to be placed at once in slings, and a smart blister to be applied over the seat of the fracture, which acts as a counter-irritant, and has the effect of keeping the part at rest, in consequence of the pain occasioned by motion. If such cases, not complicated with other serious lesions, be promptly and carefully attended to, I have no hesitation in asserting that ultimate recoveries in 9 out of 10 cases will be effected, and the usefulness of the animals preserved. But if sound practical rules of examination be neglected, and instead of a search, new discoveries in the hidden regions of invention be substituted, a mistaken diagnosis will be a necessary consequence. A notable instance of which came under my notice, when "plugging of the arteries" was diagnosed in a case of fracture. After death the mistake was indisputably proved, and the fractured portion of the pelvic bone has been preserved, and forms a very interesting specimen of a partially reunited pelvis, in my museum. It was sent to me from Fife, and occurred in a horse which was, after having been some time under treatment, destroyed for "plugging of the arteries." The body was buried; but the groom, hearing of a mistake in a similar case, and anxious to satisfy himself of the correctness of the diagnosis in his own, had the carcass disinterred, and the parts removed, when the injury was found to have been a simple fracture. In the summer before last I was sent for to a case near Cramond, which was condemned, by the same party who had ordered the Fife horse to be destroyed, for this mythical disease, plugging of the arteries. On examination I found the case to be one of fracture of the pelvis—a very extensive one—but from which, by rest in slings, and the repeated applications of blisters, the animal recovered so far as to be able to travel the country in a baker's van. But notwithstanding that horses so injured may recover sufficiently to be useful, I candidly admit that, in many cases, there is left more or less disfigurement of the haunch or quarters, occasioned by an overlapping of the ends of the fractured bones, accompanied with slight lameness, more

or less apparent. In both of the cases reported, I am happy to say, the horses have so far recovered as to be able to return to work.

The case of casting-off of the hoof occurred in a horse that had some time previously been subjected to the operation of neurotomy, or unnerving. The animal, it appeared, had been intensely lame from navicular disease, to relieve which the plantar nerves had been divided. After the operation the horse became sound and did regular work for some months. But through some cause, probably a prick in shoeing, inflammation had been set up in the foot. Owing to the parts being deprived of sensation, the animal could not, as he otherwise would have done, point out by lameness the seat and cause of injury. The consequences were that the inflammation and suppuration proceeded until the whole vascular surface of the coffin-bone became involved, the pus causing the separation of the vascular and horny laminæ, and the loss of hoof occurred.

KELSO SHOW, 4th, 5th, and 6th August 1863.

AWARD OF PREMIUMS.

Class I.—CATTLE.

SHORTHORN BREED.

Judges—Thomas Hunt, Thornington, Coldstream; Charles Randell, Chadbury, Evesham; Thomas Stobie, Balneathill, Kinross.

Attending Member—John Munro, Fairnington, Kelso.

The medium gold medal to William Lambert, Elvington Hall, Haydon Bridge, for Bull, "Master Annandale," winner of First Prize at Dumfries, 1860.

Section

1. Best Bull calved before 1st January 1861—L.20 to William Stirling of Keir, M.P., Dunblane. Second—L.10 to G. H. M. Binning Home, of Argaty, Doune. Third—The bronze medal to J. Wilson, Manor House, Woodhorn, Morpeth. Commended—James Arthur Balfour of Whittingham, Prestonkirk. The silver medal to William Stirling of Keir, M.P., Dunblane—as the *Breeder* of the best Bull.
2. Best Bull calved after 1st January 1861—L.20 to William Lambert, Elvington Hall, Haydon Bridge. Second—L.10 to Sir Thomas Buchan Hepburn of Smeaton, Bart., Prestonkirk. Third—The bronze medal to Andrew Haddon, Honeyburn, Hawick. Commended—James Tweedie, Deuchrie, Prestonkirk.
3. Best Bull calved after 1st January 1862—L.10 to A. & A. Mitchell, Alloa. Second—L.5 to James Douglas, Athelstaneford, Drem. Third—The bronze medal to Lord Kinnaird, K.T., Rossie Priory, Inchture. Commended—A. & A. Mitchell, Alloa.
4. Best Cow of any age—L.15 to Lady Pigot, Branches Park, Newmarket, Suffolk. Second—L.8 to James Douglas, Athelstaneford, Drem.

Third—The bronze medal to Colonel Ferguson of Raith, Kirkcaldy. Commended—Thomas Stark, Mellendean, Kelso.

5. Best Heifer calved after 1st January 1861—L.10 to the Duke of Montrose, K.T., Buchanan House, Drymen. Second—L.5 to James Douglas, Athelstaneford, Drem. Third—The bronze medal to Viscount Strathallan, Strathallan Castle, Auchterarder. Commended—Viscount Strathallan, Strathallan Castle.
6. Best Heifer calved after 1st January 1862—L.8 to Arthur J. Balfour of Whittingham, Prestonkirk. Second—L.4 to Viscount Strathallan, Strathallan Castle, Auchterarder. Third—The bronze medal to George R. Barclay of Keavil, Dunfermline. Commended—George R. Barclay of Keavil.

POLLED (ABERDEEN OR ANGUS).

Judges—WILLIAM M'COMBIE, Tillyfour, Aberdeen; WALTER M'CULLOCH of Ardwall, Gatehouse; GEORGE PRENTICE of Strathore, Kirkcaldy.

Attending Member—JOHN USHER, Stodrig, Kelso.

7. Best Bull calved before 1st January 1861—L.20 to Robert Walker, Portlethen Mains, Aberdeen. Second—L.10 to Alexander Bowie, Mains of Kelly, Arbroath. Third—The bronze medal to Alexander Paterson, Mulben, Keith. Commended—Thomas Lyell, Shielhill, Kirriemuir. The silver medal to Robert Walker, Portlethen Mains, Aberdeen, as the *Breeder* of the best Bull.
8. Best Bull calved after 1st January 1861—L.20 to Alexander Bowie, Mains of Kelly, Arbroath. Second—L.10 to the Earl of Southesk, Kinnaird Castle, Brechin. Third—The bronze medal to Thomas Lyell, Shielhill, Kirriemuir.
9. Best Bull calved after 1st January 1862—L.10.—*No Competition.* Second—L.5—*No Entry.*
10. Best Cow of any age—L.15 to J. H. Erskine Wemyss of Wemyss Castle, M.P., Kirkcaldy. Second—L.8 to the Earl of Southesk, Kinnaird Castle, Brechin. Third—The bronze medal to Alexander Ronaldson, Little Gight, Methlic. Commended—J. H. Erskine Wemyss of Wemyss Castle, M.P., Kirkcaldy.
11. Best Heifer calved after 1st January 1861—L.10 to the Earl of Southesk, Kinnaird Castle, Brechin. Second—L.5 to the Earl of Southesk. Third—The bronze medal to Alexander Paterson, Mulben, Keith.
12. Best Heifer calved after 1st January 1862—L.8 to the Earl of Southesk, Kinnaird Castle, Brechin. Second—L.4 to the Earl of Southesk. Third—The bronze medal to Alexander Paterson, Mulben, Keith.

POLLED (GALLOWAY).

Judges—WILLIAM M'COMBIE, Tillyfour, Aberdeen; WALTER M'CULLOCH of Ardwall, Gatehouse; GEORGE PRENTICE of Strathore, Kirkcaldy.

Attending Member—JOHN USHER, Stodrig, Kelso.

The medium gold medal to James Graham, Meikle Culloch, Dalbeattie, for Cow, "Harriet," winner of First Prize at Dumfries, 1860.

13. Best Bull calved before 1st January 1861—L.20 to John Cunningham, Whitecairn, Dalbeattie. Second—L.10 to William Keir of Whitehaugh, Newcastleton. Third—The bronze medal—*No Entry.* The silver medal to Thomas Chambers, Pelutho, Abbeyholm, Cumberland, as the *Breeder* of the best Bull.
14. Best Bull calved after 1st January 1861—L.20 to Alexander Jardine of Applegirth, Lockerby. Second—L.10 to the Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill. Third—The bronze medal to Robert Stobo of Hallidayhill, Auldgirth, Dumfries.

15. Best Bull calved after 1st January 1862—L.10 to James Graham, Meikle Culloch, Dalbeattie. Second—L.5—*No Entry.*
16. Best Cow of any age—L.15 to James Graham, Meikle Culloch, Dalbeattie. Second—L.8 to John Cunningham, Whitecairn, Dalbeattie. Third—The bronze medal to John Cunningham, Whitecairn. Commended—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill.
17. Best Heifer calved after 1st January 1861—L.10 to the Duke of Buccleuch. Second—L.5 to the Duke of Buccleuch. Third—The bronze medal to the Duke of Buccleuch. Commended—John Cunningham, Whitecairn, Dalbeattie.
18. Best Heifer calved after 1st January 1862—L.8 to Wellwood Maxwell of Glenlee, New Galloway. Second—L.4 to James Graham, Meikle Culloch, Dalbeattie. Third—The bronze medal to Wellwood Maxwell of Glenlee. Commended—Thomas Biggar of Kingsgrange, Dalbeattie.

AYRSHIRE.

Judges—John Baird of Ury, Stonehaven; John Hyslop of Bank, New Cumnock; Hugh Kirkwood, Kellermont, Maryhill, Glasgow.

Attending Member—John Clay, Winfield, Dunse.

The medium gold medal to the Duke of Hamilton, for Bull, winner of first Prize at Perth, 1861, and Battersea in 1862. The medium gold medal to the Duke of Athole, Dunkeld, for Cow, "Collyhill," winner of first Prize at Edinburgh, 1859. The medium gold medal to the Duke of Athole, Dunkeld, for Cow, "Premium," winner of first Prize at Glasgow, 1857.

19. Best Bull calved before 1st January 1861—L.20 to W. A. MacLachlan, Auchentraig, Balfron. Second—L.10 to Robert Hewetson, Auchenbenzie, Thornhill. Third—The bronze medal to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Commended—Thomas Brown, Holm, Thornhill. The silver medal to Matthew Donald, Johnstone, Renfrewshire, as the *Breeder* of the best Bull.
20. Best Bull calved after 1st January 1861—L.20 to Robert M'Kean, Lumloch, Bishopbriggs. Second—L.10 to John Stewart, Burnside Cottage, Strathaven. Third—The bronze medal to Mrs Rennie, Curriemyre, Kilsyth. Commended—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill.
21. Best Cow in milk of any age—L.10 to Alexander Fleming, Raith, Bothwell. Second—L.5 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Third—The bronze medal to the Duke of Hamilton and Brandon. Commended—The Duke of Hamilton and Brandon.
22. Best Cow in Calf, of any age—L.10 to the Duke of Hamilton and Brandon. Second—L.5 to David Tweedie, Castle Crawford, Abington. Third—The bronze medal to the Duke of Hamilton and Brandon. Commended—The Duke of Athole, K.T., Dunkeld.
23. Best Heifer calved after 1st January 1861—L.10 to Alexander Haldane Oswald of Auchincruive, Ayr. Second—L.5 to David Tweedie, Castle Crawford, Abington. Third—The bronze medal to David Tweedie, Castle Crawford, Abington. Commended—The Duke of Hamilton and Brandon.
24. Best Heifer calved after 1st January 1862—L.8 to the Duke of Hamilton and Brandon, Hamilton Palace. Second—L.4 to Miss Hope Johnstone, Marchbankwood, Moffat. Third—The bronze medal to the Duke of Hamilton and Brandon, Hamilton Palace. Commended—Alexander Haldane Oswald of Auchincruive, Ayr.

HIGHLAND.

Judges—John MacLaren, Monzie, Blair-Athole; John Lorn Stewart of Coll, Campbeltown; William Webster, Daill, Islay.

Attending Member—William Broad, Cliftonhill, Kelso.

25. Best Bull calved before 1st January 1860—L.20 to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Second—L.10 to the Duke of Hamilton and Brandon, Brodick, Arran. Third—The bronze medal to Allan Pollok, Ronachan, Clachan, Cantyre. The silver medal to John MacLaren, Monzie, Blair-Athole, as the *Breeder* of the best Bull.
26. Best Bull calved after 1st January 1860—L.20 to the Duke of Athole, K.T., Dunkeld. Second—L.10 to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Third—The bronze medal to John Malcolm of Poltalloch.
27. Best Cow of any age—L.10 to the Duke of Athole, K.T., Dunkeld. Second—L.5 to the Duke of Hamilton and Brandon, Brodick, Arran. Third—The bronze medal to Allan Pollok, Ronachan, Clachan, Cantyre. Commended—John Malcolm of Poltalloch.
28. Best Heifer calved after 1st January 1860—L.10 to the Duke of Athole, K.T., Dunkeld. Second—L.5 to the Duke of Hamilton and Brandon, Brodick, Arran. Third—the bronze medal to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Commended—The Duke of Hamilton and Brandon, Brodick, Arran.
29. Best Heifer calved after 1st January 1861—L.8 to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Second—L.4 to the Duke of Hamilton and Brandon, Brodick, Arran. Third—The bronze medal to John Malcolm of Poltalloch, Callton Mor, Lochgilphead.

FAT STOCK.

Judges—William M'Combie, Tillyfour, Aberdeen; Walter M'Culloch of Ardwall, Gatehouse; George Prentice of Strathore, Kirkcaldy.

Attending Member—John Burn, Ednam, Kelso.

30. Best Ox of any Pure or Cross Breed, calved after 1st January 1860—The medium gold medal to Thomas Stobie, Balneathill, Kinross. Second—The silver medal to David Ainslie of Costerton, Blackshiels. Third—The bronze medal—*No Entry*.
31. Best Ox, of any Pure or Cross Breed, calved after 1st January 1861—The medium gold medal to Robert Husband, Gellet, Dunfermline. Second—The silver medal to William Scott, Timpendean, Jedburgh. Third—The bronze medal to William Scott, Timpendean, Jedburgh. Commended—David Ainslie of Costerton, Blackshiels.
32. Best Ox, of any Pure or Cross Breed, calved after 1st January 1862—The medium gold medal—*No Entry*.
33. Best Highland Ox calved after 1st January 1859—The medium gold medal to Samuel Swan, The Bush, Jedburgh. Second—The silver medal to M. G. Rannie, Edenmouth, Kelso. Third—The bronze medal to M. G. Rannie, Edenmouth, Kelso. Commended—Samuel Swan, The Bush, Jedburgh.
34. Best Highland Ox calved after 1st January 1860—The medium gold medal to the Duke of Athole, K.T., Dunkeld. Second—The silver medal to the Duke of Athole, K.T., Dunkeld. Third—The bronze medal to the Duke of Sutherland, Dunrobin Castle, Golspie. Commended—The Duke of Sutherland, Dunrobin Castle, Golspie.
35. Best Cross Heifer calved after 1st January 1861—The medium gold medal—*No Entry*.

36. Best Cross Heifer calved after 1st January 1862—The medium gold medal to Robert Logan, Birkenside, Earlston. Second—The silver medal—*No Entry.*

CLASS II.—HORSES.

FOR AGRICULTURAL PURPOSES.

Judges—ROBERT CLARK, Thankerton House, Holytown; ALLAN POLLOK of Faside, Newton-Mearns; JAMES STEEDMAN, Boghall, Roslin, Edinburgh.

Attending Member—THOMAS BEGBIE, Queenston Bank, Drem.

Medium gold medal to William Kerr, Lochend, Kilbirnie, for Stallion, "Champion," winner of first Prize at Perth in 1861, and Battersea. 1862.

Section

1. Best Stallion foaled before 1st January 1860—L.30 to David Riddell, Kilbowie, Duntocher. Second—L.15 to Andrew Logan, Crossflat, Kilbarchan. Third—The bronze medal to James Kerr, Lochend, Kilbirnie Ayrshire. Commended—The Duke of Athole, K.T., Dunkeld. The silver medal to Robert Kincaid, Mains, Campsie, as the *Breeder* of best Stallion.
2. Best Entire Colt foaled after 1st January 1860—L.20 to Peter Crawford, Dumgoyack, Strathblane. Second—L.10 to Hugh Vallance, Greathill, Strathaven. Third—The bronze medal to James Lawrie, Mitchelston, Stow. Commended—Matthew Reid, Beamish Burn, Chester-le-Street, Durham.
3. Best Entire Colt foaled after 1st January 1861—L.15 to William Stirling of Keir, M.P., Dunblane. Second—L.8 to John Findlay, Easterhill, Glasgow. Third—The bronze medal to Samuel Clark, Manswrae, Kilbarchan. Commended—John Muir, Lochfergus, Kirkcudbright.
4. Best Entire Colt foaled after 1st January 1862—L.10 to Peter Crawford, Dumgoyack, Strathblane. Second—L.5 to David Riddell, Kilbowie, Duntocher. Third—The bronze medal to Robert Wilson, Nether-Johnston, Kilbarchan. Commended—David Riddell, Kilbowie, Duntocher.
5. Best Mare (with foal at foot) foaled before 1st January 1860—L.20 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Second—L.10 to William Park, Dalmuir, West-Kilpatrick, Dumbarton. Third—The bronze medal to Alexander Naismith, Windlestrawlee, Edinburgh. Commended—John Muir, Lochfergus, Kirkcudbright.
6. Best Mare (in foal) foaled before 1st January 1860—L.15 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Second—L.8 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Third—The bronze medal to Henry David Erskine of Cardross, Stirling. Commended—Wellwood Maxwell of Glenlee, New Galloway.
7. Best Filly foaled after 1st January 1860—L.10 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Second—L.5 to William Stirling of Keir, M.P., Dunblane. Third—The bronze medal to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Commended—Wellwood Maxwell of Glenlee, New Galloway.
8. Best Filly foaled after 1st January 1861—L.8 to Wellwood Maxwell of Glenlee, New Galloway. Second—L.4 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Third—The bronze medal to William Kerr, Lochend, Kilbirnie. Commended—Colonel Ferguson of Raith, Kirkcaldy.
9. Best Filly foaled after 1st January 1862—L.6 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Second—L.3 to James Lawrie, Mitchelston, Stow. Third—The bronze medal to James

Lawrie, Mitchelston, Stow. Commended—William Kerr, Wester Causewayend, Mid-Calder.

THOROUGHBRED HORSES.

Judges—J. Anstruther Thomson of Charlton, Colinburgh; Captain Percy Williams, Barnby Moor, Retford.

Attending Member—Walter Elliot of Wolflee, Hawick.

10. Best Thorough-Bred Horse to serve in the District—L.50 to J. H. Erskine Wemyss, of Wemyss Castle, M.P., Kirkcaldy (*under protest*). Commended—William Mather, King's Arms Hotel, Dumfries.

EXTRA HORSES.

The Judges highly commended :—A Hunting Colt (Gelding), belonging to John Roberton, jun., Fallsidehill, Kelso. And commended—A Thorough-Bred Colt, belonging to John Nisbet, Rumbleton, Greenlaw, Berwickshire; a Pony Stallion, belonging to James Leslie, The Thorn, Blairgowrie; and a Thorough-Bred Colt (Gelding), belonging to James B. Boyd, Doddington, Wooler.

CLASS III.—SHEEP.

LEICESTER.

Judges—Thomas Cockburn of Menslaw, Jedburgh; Thomas Harris, Stonelane, Broomsgrove; Peter Reid, Drumfork House, Helensburgh.

Attending Member—John Dove, Eccles, Newtown, Kelso.

Section

1. Best Tup, not more than four shear—L.10 to William Purves, Burnfoot, Kelso. Second—L.5 to Henry A. Rannie, Mill of Boyndie, Banff. Third—The bronze medal to Thomas Stark, Mellendean, Kelso. Commended—David Ainslie of Costerton, Blackshiels.
2. Best Dinmont or Shearling Tup—L.10 to George Simson, Courthill, Kelso. Second—L.5 to Arthur J. Balfour of Whittingham, Prestonkirk. Third—The bronze medal to Lord Polwarth, Mertoun House, St Boswells. Commended—George Simson, Courthill, Kelso.
3. Best Five Ewes, not more than four shear—L.8 to Lord Polwarth, Mertoun House, St Boswells. Second—L.4 to George Simson, Courthill, Kelso. Third—The bronze medal to Thomas Stark, Mellendean, Kelso. Commended—George Simson, Courthill, Kelso.
4. Best Five Shearling Ewes or Gimmers—L.8 to William Purves, Burnfoot, Kelso. Second—L.4 to George Simson, Courthill, Kelso. Third—The bronze medal to Thomas Simson, Blainslie, Lauder. Commended—Robert Robeson, Springwells, Birgham.

CHEVIOT.

Judges—William Grieve, Skelfhill, Hawick; William Moffat, Easter Kenleith, Currie; Henry Thompson, Ramshope, Jedburgh.

Attending Member—John Ord of Muirhouselaw, Kelso.

5. Best Tup, not more than four shear—L.10 to James Brydon, Moodlaw, Langholm. Second—L.5 to Thomas Brydon, Kinnelhead, Moffat. Third—The bronze medal to Thomas Elliot, Hindhope, Jedburgh. Commended—Thomas C. Borthwick, Hopsrig, Langholm.
6. Best Dinmont or Shearling Tup—L.10 to James Brydon, Moodlaw, Langholm. Second—L.5 to James Brydon, Moodlaw, Langholm. Third—The bronze medal to Thomas Elliot, Hindhope, Jedburgh. Commended—Thomas Brydon, Kinnelhead, Moffat.

7. Best Five Ewes, not more than four shear—L.8 to James Brydon, Moodlaw, Langholm. Second—L.4 to Thomas Elliot, Hindhope, Jedburgh. Third—The bronze medal—*No Award.*
8. Best Five Shearling Ewes or Gimmers—L.8 to James Brydon, Moodlaw, Langholm. Second—L.4 to John W. J. Paterson, Terrona, Langholm. Third—The bronze medal to Thomas Elliot, Hindhope, Jedburgh.

BLACKFACED.

Judges—ALEXANDER DENHOLM, Baitlaws, Biggar; JOHN MACLAREN, Monzie, Blair-Athole; JOHN LORN STEWART of Coll, Campbeltown.

Attending Member—WILLIAM AITCHISON, Linhope, Hawick.

9. Best Tup, not more than four shear—L.10 to Thomas Murray, Eastside, Penicuik. Second—L.5 to James Drife, Barr, Sanquhar. Third—The bronze medal to said James Drife. Commended—The Heirs of the late J. Watson, Nisbet, Biggar.
10. Best Dinmont or Shearling Tup—L.10 to Thomas Murray, Eastside, Penicuik. Second—L.5 to John Archibald, Overshiels, Stow. Third—The bronze medal to John Archibald, Overshiels, Stow. Commended—John Archibald, Overshiels, Stow.
11. Best Five Ewes, not more than four shear—L.8 to John Wilson, Crosshouse, Roslin. Second—L.4 to Thomas Murray, Eastside, Penicuik. Third—The bronze medal—*No Entry.*
12. Best five Shearling Ewes or Gimmers—L.8 to John Archibald, Overshiels, Stow. Second—L.4 to the Earl of Airlie, K.T., Cortachy Castle, Kirriemuir. Third—The bronze medal to John Inch, Liberton West Mains, Edinburgh. Commended—James Hunter, Newmains, Motherwell.

SOUTHDOWN.

Judges—THOMAS HUNT, Thornington, Coldstream; CHARLES RANDELL, Chadbury, Evesham.

Attending Member—JOHN MUNRO, Fairnington, Kelso.

13. Best Tup, not more than four shear—L.10 to James Aitchison of Alderston, Haddington. Second—L.5 to Robert Scot Skirving, Camptoun, Drem. Third—The bronze medal—*No Award.*
14. Best Dinmont or Shearling Tup—L.10 to James Aitchison of Alderston, Haddington. Second—L.5 to Robert Scot Skirving, Camptoun, Drem. Third—The bronze medal—*No Award.*
15. Best Five Ewes, not more than four shear—L.8—*No Award.* Second—L.4—*No Entry.*
16. Best Five Shearling Ewes or Gimmers—L.8 to Robert Scot Skirving, Camptoun, Drem. Second—L.4 to Robert Scot Skirving, Camptoun, Drem. Third—The bronze medal—*No Entry.*

LONG-WOOLLED OTHER THAN LEICESTER.

Judges—The same as those for Leicesters.

17. Best Tup, not more than four shear—L.10 to Thomas Beale Browne, Salperton Park, Andoversford, Gloucestershire. Second—L.5 to Lord Kinnaird, Rossie Priory, Inchture. Third—The bronze medal to said Thomas Beale Browne.
18. Best Five Gimmers or Ewes, not more than four shear—L.8 to John Gibson, Woolmet, Dalkeith. Second—L.4 to Robert Scot Skirving, Camptoun, Drem. Third—The bronze medal to the Earl of Wemyss and March, Gosford, Longniddry.

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

Judges—The same as those for Southdowns.

19. Best Tup, not more than four shear—L.10 to Allan Thomson Douglas, Moneylaws, Coldstream. Second—L.5 to John Gibson, Woolmet, Dalkeith. Third—The bronze medal to Lord Kinnaird, K.T., Rossie Priory, Inchture.

20. Best Five Gimmers or Ewes, not more than four shear—L.8—*No Award.* Second—L.4—*No Entry.*

CROSS WETHERS.

Judges—The same as those for Southdowns.

21. Best Five Shearling Wethers of any cross—The medium gold medal to Francis Calder, Yetholm Mains, Yetholm. Second—The silver medal to Francis Calder, Yetholm Mains, Yetholm. Third—The bronze medal to Francis Calder, Yetholm Mains, Yetholm.

EXTRA SHEEP.

The Judges commended—Five Cheviot Wethers, four shear, belonging to Thomas Elliot, Hindhope, Jedburgh; three Leicester Gimmers belonging to Lord Polwarth, Mertoun House, St Boswells; and five Cross Wethers, two shear, belonging to Alexander Ronaldson, Little Gight, Methlic.

CLASS IV.—SWINE.

Judges—ROBERT BINNIE, Seton Mains, Longniddry; JAMES GRAHAM, Meikle Culloch, Dalbeatie; William Purves, Burnfoot, Kelso.

Attending Member—WILLIAM SCOTT, Timpendean, Jedburgh.

Section

1. Best Boar, large breed—L.8 to Richard Dickin, 161 Old Road, Heaton Norris, Stockport. Second—L.4 to Thomas D. Findlay, Easterhill, Glasgow. Third—The bronze medal to W. B. Wainman, Carhead, Crosshills, Yorkshire. Commended—W. B. Wainman, Carhead, Crosshills, Yorkshire.

2. Best Boar, small breed—L.8 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Second—L.4 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Third—The bronze medal to James H. Erskine Wemyss of Wemyss Castle, M.P., Kirkcaldy. Commended—Thomas D. Findlay, Easterhill, Glasgow.

3. Best Sow, large breed—L.6 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Second—L.3 to Thomas D. Findlay, Easterhill, Glasgow. Third—The bronze medal to Richard Dickin, Heaton Norris, Stockport. Commended—W. B. Wainman, Carhead, Crosshills, Yorkshire.

4. Best Sow, small breed—L.6 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Second—L.3 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Third—The bronze medal to Robert Thomson, Kelston, Llanasa, Holywell, North Wales. Commended—G. R. Barclay of Keavil, Dunfermline.

5. Best Pen of Three Pigs not exceeding eight months old, large breed—L.4 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Second—L.2 to said W. B. Wainman. Third—The bronze medal to Major G. C. Dickins, Cornhill House, Coldstream. Commended—Major G. C. Dickins, Cornhill House, Coldstream.

6. Best Pen of Three Pigs not exceeding eight months old, small breed—L.4 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Second—L.2 to Nicol Milne of Faldonside, Melrose. Third—The bronze medal to the

Earl of Wemyss and March, Gosford, Longniddry. Commended—W. B. Wainman, Carhead, Crosshills, Yorkshire.

CLASS V.—POULTRY.

Judges—Lord BINNING, Mellerstain, Kelso; JAMES WILSON, Wester Cowden, Dalkeith.

Attending Member—JAMES TOWNSEND OSWALD of Dunnikier, Kirkcaldy.

Section

1. Best Coloured Dorking Cock and Two Hens—The silver medal to the Earl of Wemyss and March, Gosford, Longniddry. Second—The bronze medal to Sir John Don Wauchope of Edmonston, Bart., Newton House, Dalkeith. Commended—Mrs Dickins, Cornhill House, Coldstream.
2. Best Coloured Dorking Cockerel and Two Pullets—The silver medal to Miss Milne, Otterburn, Kelso. Second—The bronze medal to R. C, Nisbet of Mainhouse, Kelso. Commended—R. C. Nisbet of Mainhouse. Kelso.
3. Best White Dorking Cock and Two Hens. The silver medal to J. A. S. E. Fair, Gillestongues, Jedburgh. Second—The bronze medal—*No Entry.*
4. Best White Dorking Cockerel and Two Pullets—The silver medal—*No Entry.*
5. Best Coloured Cochin-China Cock and Two Hens—The silver medal to Miss Milne, Otterburn, Kelso. Second—The bronze medal to R. C. Nisbet of Mainhouse, Kelso. Commended—Robert Charters, Kalemouth, Kelso.
6. Best Cochin-China Cockerel and Two Pullets—The silver medal—*No Entry.*
7. Best White Cochin-China Cock and Two Hens—The silver medal to James Steel, Kelso. Second—The bronze medal—*No Entry.*
8. Best White Cochin-China Cockerel and Two Pullets—*No Entry.*
9. Best Bramahpootra Cock and Two Hens—The silver medal to Lord Kinnaird, Rossie Priory, Inchture. Second—The bronze medal to Miss Purves, Jedburgh.
10. Best Bramahpootra Cockerel and Two Pullets—The silver medal to Miss Purves, Jedburgh. Second—The bronze medal to Miss Purves, Jedburgh.
11. Best Malay Cock and Two Hens—The silver medal—*No Entry.*
12. Best Malay Cockerel and Two Pullets—The silver medal—*No Entry.*
13. Best Spanish Cock and Two Hens—The silver medal to John Gibson, Woolmet, Dalkeith. Second—The bronze medal to William Ridpath, 128 Causewayside, Edinburgh. Commended—Miss Purves, Jedburgh.
14. Best Spanish Cockerel and Two Pullets—The silver medal—*No Entry.*
15. Best Golden Hamburg Cock and Two Hens—The silver medal to William P. Gray, Roxburgh Street, Kelso. Second—The bronze medal to William P. Gray, Kelso.
16. Best Golden Hamburg Cockerel and Two Pullets—The silver medal to Charles Anderson, Nenthorn, Kelso. Second—The bronze medal to Alexander Virtue, Nenthorn, Kelso. Commended—John Gow, Roxburgh Street, Kelso.
17. Best Silver Hamburg Cock and Two Hens—The silver medal to Miss Purves, Jedburgh. Second—The bronze medal to Fred. Lewis Roy, younger of Nenthorn, Kelso.
18. Best Silver Hamburg Cockerel and Two Pullets—The silver medal to Miss Purves, Jedburgh. Second—The bronze medal—*No Entry.*
19. Best Polish Cock and Two Hens—The silver medal—*No Entry.*

20. Best Polish Cockerel and Two Pullets—The silver medal—*No Entry.*
21. Best Game Cock and Two Hens—The silver medal to John Gibson, Woolmet, Dalkeith. Second—The bronze medal to David Broomfield, Kelso. Commended—James Barton, junior, Jedburgh.
22. Best Game Cockerel and Two Pullets—The silver medal—*No Competition.* Second—The bronze medal—*No Entry.*
23. Best Cock and Two Hens, any other breed—The silver medal—*No Entry.*
24. Best Cockerel and Two Pullets, any other breed—The silver medal—*No Award.* Second—The bronze medal—*No Entry.*
25. Best Bantams, Cock and Two Hens—The silver medal to Miss Purves, Jedburgh. Second—The bronze medal to David Ainslie of Costerton, Blackshiels. Commended — J. Wilson, Manor House, Woodhorn, Morpeth.
26. Best Bantams, Cockerel and Two Pullets—The silver medal to David Ainslie of Costerton, Blackshiels. Second—The bronze medal to George James Hervey, Jedburgh.
27. Best Capons, three of any breed—The silver medal—*No Entry.*
28. Best White Aylesbury Drake and Two Ducks—The silver medal to R. C. Nisbet of Mainhouse, Kelso. Second—The bronze medal to Samuel Swan, The Bush, Jedburgh. Commended—Lord Kinnaird, K.T., Rossie Priory, Inchture.
29. Best Rouen Drake and Two Ducks—The silver medal to John Gibson, Woolmet, Dalkeith. Second—The bronze medal to John Scott Dudgeon, Spylaw, Kelso. Commended — John Gibson, Woolmet, Dalkeith.
30. Best Drake and Two Ducks, any other breed—The silver medal to Lord Polwarth, Mertoun House, St Boswells. Second—The bronze medal —*No Entry.*
31. Best Black Norfolk Turkeys, Cock and Two Hens—The silver medal to Lord Kinnaird, K.T., Rossie Priory, Inchture. Second—The bronze medal—*No Competition.*
32. Best Turkey Cock and Two Hens, any other breed—The silver medal to Lord Kinnaird, K.T., Rossie Priory, Inchture. Second—The bronze medal—*No Entry.*
33. Best Gander and Two Geese—The silver medal to Lord Kinnaird, K.T., Rossie Priory, Inchture. Second—The bronze medal to Samuel Swan, The Bush, Jedburgh. Commended — Lord Kinnaird, K.T., Rossie Priory, Inchture.

Class VI.—IMPLEMENTS.

The Inspecting Committee in the Implement Department have to report that, in consequence of the alteration in the rules of the Society, their powers of recommending prizes to the exhibitors generally have been restricted to those exhibiting implements embracing new inventions or radical improvements. Of these there were few, and those which were so entered did not appear to possess merit sufficient to call for trials or special prizes. The Inspecting Committee, however, are happy to be able to state that the whole exhibition is of a highly satisfactory character, the implements showing excellent workmanship and a gradual improvement in their parts.

(Signed)	J. Miller.	John Curror.
"	James W. Hunter.	Jas. Stirling.
"	John Gibson.	Alex. Slight.

PROCEEDINGS IN THE LABORATORY.

By Thomas Anderson, M.D., Professor of Chemistry in the University of Glasgow, and Chemist to the Society.

ON THE COMPOSITION OF A PARTICULAR KIND OF EFFLORESCENCE FOUND ON THE SOIL IN SOME PARTS OF INDIA.

The farmer in our country may often derive information and instruction from the difficulties encountered in other parts of the world; and even though the same conditions may never occur in his own practice, they may serve to enforce principles and explain facts of analogous character.

It was formerly universally supposed that the substances absorbed by the plant must not only be capable of dissolving in water, but must actually exist in solution in the soil; and when chemists showed how small a proportion of valuable plant food could be extracted from the most fertile soils by water, their results naturally excited no little surprise, from their being totally at variance with the teachings of vegetable physiology. The reason, however, became obvious when it was discovered that all soils, and more especially all those distinguished by their fertility, possessed the property of absorbing these substances and converting them into a state in which, though sparingly soluble in water, they can nevertheless be easily dissolved and assimilated by plants; and it then came to be inferred that, so far from being advantageous to have substances in solution in the soil, it is the very reverse. It has been long known that, when saline matters are added to the soil in considerable quantity, even though those which are essential to the existence of plants be selected for the experiment, their effect is injurious; and this is clearly due to the soil being incapable of converting more than a certain quantity of them into that particular insoluble condition in which they can best minister to the wants of the plant. In short, the fertility of a soil is increased by the addition of plant-food only so long as it can absorb it, and any considerable quantity remaining in it in a soluble condition operates injuriously.

The injurious effect of substances, in themselves useful and necessary to plants, is instructively illustrated by a kind of efflorescence appearing in the soil in the Punjaub and other north-western provinces of India, and more especially in soils which have been irrigated by the canals. The substance in question, which is locally called Rèh, appears upon the surface in considerable quantity, and totally destroys vegetation, every kind of crop and pasture-land being equally affected by it, and only a few jungle trees left upon the whitened surface. At the present time large tracts of country are thrown out of cultivation, and appear white, as if covered with new-fallen snow. Nothing definite appears to have been ascertained in the country regarding the cause of this efflorescence, nor has any

attempt been made to get rid of it. But the soil has, in the mean time, been sown with the seeds of the koekur tree (a species of acacia), in the hope that it may produce a sufficiency of the wood, which is useful for fuel.

A small specimen of the rèh itself was sent home by Colonel Maclagan to Dr D. Maclagan, by whom it was intrusted to me for analysis. It consisted of a grey powder as it reached me, and was obviously a mixture of the rèh itself with a small quantity of the soil on which it had been formed; and, in point of fact, more than three-fourths of it proved insoluble in water. Its analysis gave—

Alumina,	2.52	
Oxide of iron,	trace.	
Lime,	1.09	
Magnesia,	0.51	
Potash,	1.84	
Soda,	1.44	
Chloride of sodium,	10.41	
Sulphuric acid,	6.06	
Total soluble in water,	——	23.87
Peroxide of iron,	3.30	
Alumina,	1.95	
Lime,	1.84	
Magnesia,	0.98	
Phosphoric acid,	trace.	
Total soluble in acids,	——	8.07
Silica and insoluble silicates,	54.46	
Organic matter,	6.61	
Water,	7.40	
	——	100.41

The soluble part here consists of a mixture of common salt with sulphates of lime, magnesia, alumina, potash, and soda—all, with the exception of sulphate of alumina, being substances found in plants; and there can be no doubt that it is the excessive supply of these elements in a soluble state which operates so prejudicially.

The source from which these substances is derived it is impossible to ascertain without more information than we at present possess. In India it has been generally attributed to the irrigation water; and with the view of ascertaining the accuracy of this opinion, a partial analysis of the water of the river Ravee, which supplies the canals in the district where rèh has been most frequently observed, was made some time since in India. The results, though not in all respects satisfactory, appear to me to refute this view. The water is found to contain 7.14 grains of solid matter per imperial gallon, consisting chiefly of sulphate of soda and carbonate of lime, with, as it is stated, a small quantity of sulphate of alumina. These, no doubt, are all substances found in the rèh; but it is clearly impossible that the water should yield them in sufficient

quantity to produce an appreciable effect on the soil. It is very clear that, if this be the source from which it is derived, it can only be deposited by evaporation, and 10,000 gallons of water would be required to yield 1 lb. of alkaline salts.

I have no knowledge of the quantity of water used for irrigating in India, but it is very clear that an enormous mass would require to be evaporated to yield even a very trifling quantity of solid matters. If we suppose the soil to be covered a foot deep with the water, and the whole evaporated, it would leave only 128 lb. of alkaline salts per acre, or less than half an ounce to each square yard of surface, a quantity which would not yield an appreciable efflorescence. On looking at it in another point of view, the soil 10 inches deep in an acre of land weighs upwards of 1000 tons, and the 128 lb. of solid matter would be little more than $\frac{1}{20000}$ of its weight,—a quantity totally imperceptible. It would, in fact, require the evaporation not of one but of many feet of water in order to give a sufficient quantity to constitute an efflorescence. Further, it is to be observed that the rèh does not appear on all the soils irrigated by this water, some being entirely free from it.

It is much more probable that the effect is due to the nature of the soil itself, which probably contains some minerals rich in alkaline salts, the decomposition of which is promoted by the action of moisture. If iron pyrites be present, the production of sulphuric acid, and the presence of sulphates of alumina, lime, &c., may easily be explained; but it would still be difficult to account for the presence of common salt. It would, in fact, require a minute study of the soils and waters, and probably also of the geological features of the country, before a satisfactory opinion could be formed on the point.

Whatever the source may be, it is clear that the appearance of rèh on the surface indicates a want of drainage, so that the matters which exist in solution in the soil are not carried off, but are retained there after the evaporation of the water of irrigation; and the cure obviously consists in allowing the water to percolate abundantly through the soil, so as to enable it to wash out the excess of saline matters by which it is rendered sterile. Of course this opinion may be liable to modification on further information; but, meanwhile, the facts are of interest, and show us that circumstances may arise in which too large a quantity of plant-food may exist in the soil.

ON THE RELATIVE FEEDING-VALUES OF TARES AND "PEAS BROCK."

"Peas Brock." is the name applied to the outer skin of the pea, which is removed by a particular process of grinding in making split-peas, and is used pretty extensively for feeding stock, being sold for this purpose at about £6 to £6, 10s. per ton. A member of the Society, who uses it extensively, being doubtful as to its

value, submitted a sample for analysis, with the view of ascertaining whether it would not be more economical to use tares, though costing more, their present price being about £7 per ton. To determine this point, comparative analyses were made in the ordinary manner, and the results obtained were as follows:—

	Tares.		Peas Brock.
Water,	15.36	...	9.36
Oil,	1.87	...	2.82
Albuminous compounds,	20.06	...	9.00
Starch, sugar, &c.,	53.93	...	41.51
Fibre,	5.34	...	33.59
Ash,	3.44	...	3.75
	100.00		100.00
Nitrogen,	3.21	...	1.44
An ash contained—			
Phosphates,	0.54	...	0.68
Sand,	0.02	...	0.66

The difference between these substances is very considerable, and much in favour of the tares, which contain more than twice as much albuminous compounds, and considerably more starch and sugar than the peas brock. The latter, moreover, contains a very large quantity of fibre, which may be said to be valueless as far as feeding is concerned. It is difficult to give a perfectly definite estimate of the relative values of these two substances; but if we calculate from the relative quantities of albuminous compounds and starch in the two, and if tares be assumed to cost £7, the peas brock should not be sold at more than about £5 per ton, or a considerably lower price than that at which it at present sells.

I may observe here that the result of a good deal of experience has led me to the conclusion that most kinds of refuse matters produced in manufacturing operations are sold at prices considerably higher than their quality justifies. This is perhaps less applicable to such substances as can be applied to the feeding of stock than to those which are sold as manures. Refuse lime, for example, often in a very moist state, is frequently sold at a price higher than that at which quicklime can be got direct from the kiln, and the refuse of the comb-makers and bone-turners is often overrated in value. This is not because they are not possessed of a definite value, but because, being refuse in the manufactories in which they are produced, they are not preserved with any care, but become mixed with rubbish of all kinds, and in large quantity, and hence a purchaser, who pays a price which might be moderate if the substance were pure, is made to give a full price for a mixture of inferior value. Of course this does not occur to the same extent in the case of mill refuse, which, having a definite and considerable value, is kept clean and pure; but, nevertheless, the price asked is generally too high, and its value is fixed more in reference to the substance for which it is produced, than in relation to its intrinsic worth.

ON THE RECLAIMING OF WASTE LAND.*

By John Clark, of Kirkland Park, Strathaven.

[Premium—The Gold Medal.]

The reporter does not know the precise elevation of the lands improved, but believes it to be, when lowest, a little over 400 feet, and, when highest, perhaps 550 feet above the level of the sea. The lands are situated about fourteen miles south-west of Glasgow, and about ten miles from the nearest point of the Firth of Clyde. They are mostly in Ayrshire, but partly in Renfrewshire. They consist of two conterminous farms, and extend in all to 335 acres, or thereby. More than half the extent reported upon was, strictly speaking, waste land. It consisted of "spritty" marshes interspersed with "bent" and moss, and dotted here and there with patches of dry land resting on whin rock. The yearly value of one-half of it might vary from 5s. to 10s. per acre prior to improvement. Such lands, intersecting and interlacing more or less the whole extent, rendered the naturally dry land comparatively unavailable for any purpose of agriculture. The farms comprised a considerable extent of superior meadow and some productive "croft" land, which raised the rental of the whole prior to improvement to an average of about 16s. per acre. The subsoil of the swamps is generally clay at a depth of from two to four feet. Veins of sand generally traverse the clays at various depths. Instead of clay subsoil, sometimes there is sand, gravel, or marl, and this especially at the swamps near the dry spots. A band of "chatter" also not unfrequently succeeds the clay, or immediately underlies the saturated upper soil. Whin rock and fast stones at every depth and in unlooked-for positions were the great difficulties the reporter had to contend with in drainage. He found the obstructions from these causes especially formidable and irksome in the formation of the mains and outfalls, and is inclined to ascribe to them in no small degree the almost total absence of efficient drainage till very lately in his neighbourhood. In his drainage, except at the very first, he used the pipe-tile almost exclusively. The reporter began his improvements in the autumn of 1847, and in order to give a clear view of his mode of operation and its results, he would take up the different fields and portions of the farms separately, namely—

No. 1.—This field, extending to 13½ acres, was of the average quality of the farms, or about 16s. per acre. It was drained generally about 3 feet deep by 15 to 18 feet apart. The material used was partly tile and sole, partly pipe-tile. This field was a very expensive one to drain, partly on account of the quantity of whin rock, partly on account of the system pursued.

* This report, it ought to be stated, was written in 1855.

The drains are much too shallow and much too close together. Though telling well at present, the reporter does not doubt that many of the drains will ultimately require deepening. The drainage of this field, as given in to the Inclosure Commissioners for England and Wales, cost £9, 5s. 7d. per acre. After drainage, a crop of sandy oats was taken. The crop was excellent for the part of the country—not measured exactly, but should say not under 50 bushels per acre. 2 cwt. of guano per acre were harrowed in with the seed. Potatoes and turnips followed the oat crop. The turnips were fair, but the potatoes were much diseased. Both potatoes and turnips were limed on the top of drills. Oats similar to the lea crop as to quality and value, with grass seeds, followed the green crop. The hay crop (principally perennial rye-grass and clover, but with a mixture of natural grasses) was generally very heavy. It was sold on field uncut, and some of the lots were as high as £6, 10s. per acre; average from £4 to £5. The foggage was let for sheep at 10s. per acre. After the hay crop, pasture followed. The field was let by public roup as a grass park, and produced £29, 10s. Next year it was again let at £24. The year following it was again let by public roup as a grass park, at £30.

No. 2.—This field was drained at the same time and in the same manner as No. 1. It extends to 6 acres and 7 poles. It was not nearly so difficult to drain as No. 1, and required no trenching. The expense, including fences, approached £50. Prior to drainage, the land was much more valuable than No. 1. If let separately, it might have given 30s. per acre,—say £9 for the field. Till last year no opportunity was afforded of testing its new value. It was let in its improved state, at Martinmas 1853, as a grass park, at £15, 17s. 6d.

The course of cropping of No. 2 was the same as No. 1, except that barley to some extent took the place of oats after the green crop. The value of the crops of the two fields was very similar.

No. 3.—This field extends to 11 acres, 1 rood, 6 poles. It was drained in spring and summer of 1848 at an expense of £55. To this falls to be added £15 for fencing, &c. The whole expense of improvement amounted as near as possible to £70. The drains in this field were 4 feet deep, and at irregular distances apart, there being a good deal of dry land in it. It was, prior to improvement, one of the best fields in the farm. It might have let as a grass park at 30s. per acre. In spring of 1849 it was broken up, and a crop of oats taken—partly sandy, partly birley oats. Crop looked like 50 bushels per acre, but not measured. The upper end of the field had 2 cwt. of guano per acre harrowed in; the lower end received no dressing of any kind. In 1850 a second crop of oats was taken, and the land sown down with a mixture of perennial white and yellow clovers, and several kinds of natural grasses. About 40 square yards per acre of farmyard manure were put in with the oats over the whole field, and on that portion of it which

got no guano in the lea crop, about 20s. worth per acre of bone-dust was added to the farm-manure. The crop was superior to the lea one—indeed it was rather too bulky. It was sold on foot by public roup at prices ranging from £5 to £6 per acre. The hay crop next year, also rouped on foot, averaged about £4 per acre. The foggage was afterwards let for sheep-grazing till April at 10s. per acre. It ought to have been stated that, after the removal of the second oat crop, the whole field was limed at the rate of from 4 to 5 tons of shells per acre. In 1852 the field was pastured with a mixed stock; in 1853 it was also so pastured—both years at original rent, on account of existing bargain. In December 1853 the field was let by public roup as a grass park at £22. Last Martinmas it was again rouped as a grass park, when the rent rose to £25, 15s.

No. 4.—This field extends to 17 acres, 2 roods, 15 poles. The drainage of it was partly executed in winter of 1847, spring of 1848, and spring of 1849. In the portion earliest drained, the writer considers the drains as much too shallow and too close together. The depth varies from 3 to 3½ feet; the distance apart is 15 feet. About 7 acres of the field are drained on this system, of which 1 acre or so shows symptoms of damp; the remainder seems dry at present, and is covered with a rich coating of fine grasses. The writer intends deepening each alternate drain of the above 7 acres to 5 feet prior to further tillage. The portion of the field drained in spring of 1849, is done with 5-feet drains placed 18 feet apart, and in this portion the improvement is perfect. The writer now considers that instead of 18 feet, the drains might have been 30 feet apart, and the effect the same. As it is, the drainage of this field as a whole was not expensive, much naturally dry land being interspersed through the swamps, and the interruptions by whin rock not being frequent or serious. The opening of a very long outfall was the principal disadvantage. Drainage, outfall, fencing, &c., cost, in round numbers, £120. Prior to improvement, two-thirds at least of this field was perfectly useless as far as tillage was concerned. For grazing young cattle the 17½ acres odds might be worth £8 yearly. The drainage of this field being done at different times the cropping was irregular. Two-thirds of it was green-cropped, the remainder sown down with oats, 40 yards of farmyard manure per acre being put in with the seed. The oat and turnip crops were fair as a whole, the potatoes much blighted, the hay excellent on the formerly wet lands; on the naturally dry portions, generally rather a light thin crop. About half this field has been limed; the remaining half is still to lime. In December 1853, this field was let by public roup as a grass park, at £31, 10s. Last Martinmas it was again let by public roup as a grass park, and it made £39, 5s.

Nos. 5 and 6.—These two fields (hitherto let together) extended to 19 acres, 1 rood, 26 poles. They were drained partly in spring and summer of 1848, partly in spring of 1849. They contained con-

siderable portions of tolerably dry land, and being near the farm house, these portions had been repeatedly manured. Taking wet with dry they might be worth from 20s. to 30s. per acre—say 25s. over head. The drainage of these fields seems perfect. Whin rock was frequently annoying, and interfered materially with the depth of the drains; but wherever practicable the drains were about 5 feet deep, the distance apart varying from 18 to 30 feet. About 2 acres of these fields were green-cropped (after being trenched) in 1848. The crop-potatoes—except a small patch of carrot—was, though partially diseased, much above an average. In spring of 1849, the fields were wholly broken up, and one crop of oats taken, about 40 yards of farmyard manure being applied to the greater portion of the extent. When green-cropped the previous year, no top-dressing of any kind was applied, and 3 acres or thereby of swamp got instead of farmyard manure, which ran short, from 2 to 3 cwt. guano per acre. The crop (sandy oats, except the green-cropped land, which was tartar oats) would average 48 bushels per acre, except on the green-cropped land, which produced fully 72 bushels per acre. The fields were wholly sown down with perennial ryegrass, clovers, and a variety of natural grasses. As soon as possible after the removal of the oat crop, the fields were limed at the rate of about 5 tons of shells per acre. In 1850 the hay crop was excellent; on the green-cropped land especially it was very bulky. It was rouped on the foot, and realised rates varying from £3 up to about £5 per acre. After the removal of the hay crop, the foggage was let by public roup from 1st September till 20th April following, at £10, 10s. In 1851 and 1852 the fields were grazed with mixed stocks, and were observed to graze very far; but on account of a peculiarity in the arrangement with the old tenant, no opportunity of testing their value occurred till the end of the last-named year. In December 1852, the fields were let by public roup as grass parks, at £38, 5s. In December 1853 they were again let by public roup as grass parks, at £39, 10s., and last Martinmas they were again let as grass parks, at £43, 15s. The drainage, fencing, trenching, and levelling of the two fields cost, in round numbers, £160.

No. 7.—This field extends to 11 acres and 7 poles. It was drained in spring and summer of 1848; drains from 4 to 5 feet deep, and 18 feet apart, except 2 acres, where they are 30 feet apart. The 2 acres were lying in 30 feet ridges, with deep furrows. No difference perceptible as regards dryness between the 30 feet and the 18 feet drainage; both seem perfect; 2 acres of the latter were trenched and planted with potatoes in 1848. The crop, though diseased considerably, produced about £16 per acre. In 1849 the whole field was in oats; it received, except the green-cropped land, about 2 cwt. of guano per acre; the green-cropped land, which was sown with tartar oats, produced upwards of 72 bushels per acre, but the other portions (partly sandy, partly tartar-oats) were very unequal, and would not average over half as much. The green-cropped land was sown down

principally with timothy-grass and perennial ryegrass, and in 1850 the hay was sold by public roup on foot at about £5 per acre; it was an extra crop. In 1850 the rest of the field was in turnip, carrot, and potatoes. The carrot ground (3 roods) was trenched, and the crop above an average. The potatoes (2 acres) were much blighted, and a poor crop. The turnips were irregular, but on the whole a bulky and superior crop. In 1851 the whole field (except the 2 acres green-cropped in 1848) was again put under carrot, potatoes, and turnips. The carrots occupied about 2 acres, the potatoes 1 acre, the turnips the remainder of the field. The carrot-land was half trenched. The potatoes, as usual, were much diseased, but the carrots and turnips were excellent. The 2 acres in hay last year were again rouped on foot, and produced above £5 per acre. The timothy this year greatly predominated. In 1852 the twice green-cropped land was sown with birley-oats, which were sold on foot by public roup at prices varying from £5, 5s. to £6, 10s. per acre. The field averaged, it was understood, about 10 bolls per acre, milling "meal for corn." In 1852 the 2 acres of hay-land (now irrigated) were sold in ricks, producing much about the same as in 1851. In 1853 the whole field was in hay, and sold on foot by public roup, realising from £4 to £5 per acre. After the removal of the hay crop, the foggage was let for sheep-grazing up till 1st April, at 10s. per acre. Last year it was again hay, and sold by public roup, partly in ricks, partly on foot; the prices and crop were much the same as in 1853. The foggage was also again let for sheep-wintering; it was a shade dearer. The grass of this field is principally timothy; and as a great portion of it can be irrigated, cutting is intended to be continued. Including foggage, the rate has hitherto been above £5 per acre, and it seems not unreasonable to suppose that something like the same figure may be maintained.

No. 8.—This field extends to 21 acres and 37 poles. It was drained in summer of 1849. Drains from 4 to 5 feet deep and upwards, and generally about 18 feet apart. A good deal of naturally dry lands in the field, but detached and indented with marshes and quagmires. In its unimproved state its value might be about the average of the farms,—viz., 16s. per acre. After drainage the field was limed to the extent of about 4 tons of shells to the acre. This field has never been broken up, and till the end of 1852 (owing to the lease) no opportunity was afforded of testing its value. The expense of draining, fencing, and smoothing up this field was about £170. In December 1852 it was let by public roup as a grass park at £40, 15s. to the old tenant. In December 1853 it was again rouped as a grass park, and produced £41, 10s. Last Martinmas it brought £44, 5s.

No. 9.—This field contains 13 acres. Except about 3 acres it was "waste land." As far as any purpose of tillage was concerned it was merely a spritty swamp. Including the 3 acres of dry land, the annual value might average 10s. per acre. It is proper to state that, prior to the commencement of the improve-

ments which are the subject of the present report—viz., in 1843 and 1844—the tenant in the lands (the tiles being furnished free by the landlord) made a sort of drainage of this field. The drains were shallow and ineffectual, but they enabled him to plough green crop and lay down the land. Though much improved, it had for the most part from the first the blue, cold appearance inseparable from wet, and, so far as the writer's experience goes, inseparable from shallow draining, especially in boggy land. Therefore, in summer of 1849, the proprietor set about draining the field afresh, paying no attention to the old drains as he proceeded, beyond removing the tiles. The old drains were principally across the hill, and about 30 inches deep. When it could be effected, they avoided the rock by going round it. When that could not be managed, they stopped upon reaching it. The new drains, 4, 5, or 6 feet deep, according to subsoil, were cut right up the acclivity, and never avoided the rock. When blasting or any very arduous picking was necessary, they were cut into the rock, say to the depth of 30 inches to 3 feet, *where shallowest*, and allowed to drop backwards and forwards from the shallowest point—forward into the continuation of the drain—backwards into a cross-drain communicating with one of the up-and-down drains in which rock did not occur. The writer had learned, from experience, that without breaking up the rock freely, and to a sufficient depth, in such springy lands, his draining would be a failure—hence he never attempted (except at the very outset of his improvements) to double round it. At first he did attempt to save in that way, but instead of saving he just, by being obliged to go back on his work, put himself to more expense than was necessary, and this over and above the injury resulting to his crop. The new drains were placed 18 feet apart. All the extra subsoil from the drains was spread on the ground, and the turf neatly replaced over the drain on the surface. After drainage the land was limed, say to the extent of 4 tons of shells to the acre. The effect produced by the new drainage was in 1850 most perceptible, and in 1851 and 1852 the field had exchanged its cold, blue, spungy surface with its coarse-pointed grass for one rich carpet of green velvet. The draining and fencing of this field cost, from first to last, about £90. On account of the lease no opportunity of testing its value offered itself till December 1852. It was then let by public roup as a grass park, at £27, 5s. In December 1853 it was again rouped as a grass park (snow was on the ground), at £25, 15s. In 1854 it was let at £34.

No. 10.—This field extends to 8 acres and 1 pole. Except a dry spot of about 2 acres, it was, prior to improvement, mere bog and bent. Its average value, in 1848, was 8s. per acre. In the winter of 1848 it was drained, and in the spring following (except the dry spot which was ploughed), it was either deeply dug or half-trenched according to circumstances, and levelled. The drains were 4, 5, and often 6 feet and upwards deep, and 24 feet apart. It may here

be noted that, except at the outset of his improvements, the reporter always contracted for 4-feet drains. No drain was intended to be under 4 feet. The additional depth he took out by the day, and made it more or less according to the nature of the subsoil. He has drains in several of the marshes 9 feet deep in particular spots. 6 and 7 feet was a common depth in such subsoils. A crop of oats with from 2 to 3 cwt. of guano per acre was taken. It was exceedingly patchy and irregular, and on the whole gave a very poor return. The land was limed after the removal of the oats to the extent of, say, 5 tons of shells per acre, and gave tolerable crops of hay in 1850 and 1851. It should have been stated that it was sown down with a thick coating of uncleaned grass seeds, bush harrowed, except the dry spot, which was sown down in the common fashion. In spring of 1852, the whole field was deeply dug, richly manured with farmyard dung and guano, and a green crop taken. The potatoes would have given an excellent return, but for disease. The turnips were much above an average crop. Both turnips and potatoes were put in and wholly managed without horse work. In spring of 1853 the land was again dug and oats and grass seeds sown, with a second dressing of lime harrowed in. The oats (sandy and early angus) were sold by public roup on foot, at prices ranging from £6 to £7 per acre. It was a heavy well-filled crop, but great loss sustained from the wet harvest. The grasses sown were principally perennial ryegrass and timothy. The crop of hay was rouped this year on foot, at an average of £3, 15s. per acre. To this falls to be added the sheep grazing of the foggage at 10s. per acre. The hay crop was much injured by the bulk, and consequent laying of the oat crop, as well as by the length of time the wet harvest caused it to remain on the ground. It was strong, but with many blanks. The field is intended to be cut again this season when the timothy grass is expected to have come up. As a grass park, the proprietor expects to get at least £2 per acre for this field. It was expensive to improve, costing, in round numbers, for drainage, first digging, half-trenching, levelling, and fencing, £100.

No. 11.—This field extends to 14 acres and 27 poles. The annual value of this field in 1849 could not be over 8s. per acre. It was partly thrashy swamp, partly bent, interspersed at wide intervals with dry spots, resting, as usual, on whin rock. In the autumn and winter of 1849 and spring of 1850, the field was thorough drained—drains 5 feet and upwards in depth and 27 feet apart. After drainage the land was ploughed where the surface permitted; where it was too rough and broken for the plough it was dug or half-trenched according to the degree of roughness, &c. In the spring of 1850 the whole was sown with sandy oats and grass seeds. As the ploughing or digging proceeded the land was wholly limed, to the extent of, say, 4 tons of shells to the acre. It was done more heavily or lightly according to the degree of toughness, some of the wilder portions having a coating of

earth, clay, marl, or gravel carted upon them prior to liming. As in the case of the other fields, the subsoil from the drains was used for this purpose as far as it would go. The crop of oats was very irregular. It might vary from 4 bolls up to 6 or 7 bolls per acre, but was not measured. In 1851 the hay crop would average about 1¾ tons per acre. The foggage was eaten off with sheep, and after a top-dressing of soot next spring a second hay crop was taken about equal to the first. After the removal of the hay a second dressing of lime, equal in quantity to the first dressing, was applied to the wilder and tougher portions of the field. In December 1852 the field was let by public roup as a grass park, and produced £25, 5s. It was grazed wholly with sheep. In December 1853 it was again let by public roup as a grass park, and produced £24. In 1854 it was again rouped as a grass park, and was let at £27, 10s. The drainage, digging, fencing, and levelling of this field cost about £140.

No. 12.—This field extends to 9 acres, 2 roods, 12 poles. Its original state quite similar to No. 11, only a degree wilder, with fewer dry spots. The only difference in the treatment was that more earth was carted on the surface, two crops of oats taken from a portion of the field with an extra coating of earth, and second liming, and that nearly the whole was surface-dressed with farmyard manure. The first oat and hay crops very similar to those of No. 11. The second oat crop and the hay following it were excellent—quite equal to the crops of the "croft" land of the district. The second oat crop had, say, 2 cwt. of guano per acre sown on the braird—the lime having been applied early in the spring, in order to afford a considerable interval between the dressings. Without such interval the writer would not approve of the application of both lime and guano to the same crop. In December 1853 this field was let by public roup as a grass park, and produced £16, 15s. In 1854 it was again rouped as a grass park, when the rent rose to £18, 10s. Both this field and the last (though still rough-looking and showing spritts in many places) are thoroughly dried, and grazed remarkably well in 1855.

No. 13.—This field extends to 21 acres, 3 roods, 36 poles. It was drained in the winter of 1850 and spring of 1851. The drainage, cropping, and treatment, with the quality of crops, were very similar to those of No. 11. The rate of outlay was also much the same. The oat crop was limed at the rate of 5 tons per acre, but no second liming has been applied to any portion of the field. The wilder portions were done with farmyard manure on the hay-stubbles instead of lime. About half the field has been so manured. In the spring of 1852 the sown grass was dressed with soot, and after the removal of the hay crop the foggage eaten off with sheep. In the spring of 1853 a second dressing of soot was applied; and after the removal of the second hay crop the foggage was let by public roup for sheep grazing, from 10th September till 1st April

following, at £13 for the field. In December 1853 the field was let by public roup as a grass park, and produced (over and above the foggage as above noted) £36. Last Martinmas it was again rouped as a grass park, when it produced £39, 10s. Prior to 1851 this field used to let at about £8. The expense of draining, digging, and half-trenching, levelling and fencing the field was, as before stated, as near as possible £10 per acre, or £220 for the whole.

No. 14.—This field extends to 14 acres and 15 poles. It was drained in spring and summer of 1850 with 5-feet drains 30 feet apart. It had been levelled, thrown into 15-feet ridges, with deep furrows, and potatoed many years before. As after crops proved, it had been richly manured, but was perfectly saturated with water, and, except a small portion of the crown of the ridges, was one mass of strong spritts. In this state its value could not be over 16s. per acre, or the average value of the farms prior to improvement. After drainage the field was pastured during the remainder of the season. In winter, and early spring following, the field was ploughed where it would carry the horses, and dug where it would not. It would be ploughed with the exception of, say, an acre, in patches here and there. The whole was sown with oats, top-dressed with lime, and the crop produced was equal to the best in the district. It was sold by public roup on foot at from £6 to £7 per acre. After the removal of the crop, about two acres of the field were trenched 16 inches deep for carrot; the remainder of the field was again ploughed very deep for oats. The second crop was at least equal to the first. It was sold in stacks, and realised about £10 per acre. It was top-dressed with about 2 cwt. of guano per acre. The kind of oats was Sandy and Birley both years. The carrots averaged about 12 tons per acre. The Altringham and White were over this weight—the Long Red and Orange rather under it. A sample of Early Horn from the field took the district prize. The return was about £30 per acre. They were sold by public roup. In 1853 this portion of the field was sown with Tartar oats and grass seeds. The crop would have been quite extra except for the wet season. As it was it was too bulky. The remainder of the field, after being wholly half-trenched and levelled, was dressed with a variety of portable manures—viz., so much with guano, so much with superphosphate of lime, so much with a mixture of saltpetre, salt, and gypsum, so much with bone-dust, &c., and again sown with oats. The writer's original intention was to green-crop the whole; but being obliged to forego this intention on account of other pressing engagements, he took what he thought at the time the readiest and most profitable method of getting the land sown down. The third oat crop, though inferior to the other two, was quite above the average crops of the district. Being still bulky, the wet season laid it very much. As a further consequence of the wet and late season, the sown grasses which came up thin, unequal,

and with many total blanks, gave an unseemly, and, on the whole, neither a fine nor heavy hay crop. Though strong, the thinness and blanks brought down the average to little more than 1½ tons per acre. The blanks and thin places were re-sown, and the field heavily top-dressed with soot last spring. Though the re-sown grasses did not come up in time to mend the hay crop to any extent, they swarded the field, and the foggage was most luxuriant. It was eaten off with sheep. It was not let; but, judging from the fields that were, it was worth at least 12s. per acre. The field is to be grazed this season wholly with sheep. It is intended to follow this up with a dressing of farmyard manure, and finally with irrigation. As there is ready command of abundance of water, the field, as a meadow, will be worth £4 per acre. The expense of draining, trenching, half-trenching, levelling, and fencing this field, was about £150.

No. 15.—This field extends to 22 acres, 3 roods, 20 poles. It was drained in spring and summer of 1851. Drains 5 feet deep by 27 feet apart. Considerable extent of dry land in this field. In its original state it let for young cattle at from £18 to £20 per annum. The drainage, fencing, digging, and levelling of this field cost, in round numbers, £200. In 1851 and 1852 it was grazed by the old tenant, and, on account of his lease, its increased value was not tested. In spring of 1853 it was broken up, being for the most part ploughed, but digging being necessary to some extent all over the field. The dry portion of the field had been limed prior to drainage; the wet portions were limed immediately after it. The field was sown with sandy oats, and at same time sown down with grass seeds, perennial ryegrass and timothy predominating. The oat crop was much above the average of the district. It was sold on foot by public roup at from £5 to about £6 per acre. After the removal of the oats, the field was dressed with farmyard manure to the extent of from 30 to 40 yards per acre. On account of the bulk of the oat crop, and the length of time it remained on the ground, the young grasses came up irregularly, and showed many blanks. The hay crop was excellent in quality, but, from the causes above noted, light by the acre. It was sold in ricks, and averaged about 1½ ton per acre. If the hay was not what might have been expected, the foggage was very good, and let, up to the 1st of April 1855, at £14. On the 2d April this field was let by public roup as a grass park, and produced £55.

No. 16.—This field extends to 18 acres and 38 poles. It was drained in spring of 1852—drains 5 feet deep by 30 feet apart. About 8 acres of this field was, prior to the improvements, the best land on the farms, with the exception of the meadows. The remainder was in a state very similar to No. 14. The 8 acres might be worth, say, £18; the remainder of the field worth £8 per annum. In all, the field might be worth £26 per annum, but had never been let separately. The draining, fencing, digging, and levelling of this

field cost about £140. After drainage the field was grazed for the season by the old tenant without any change of rent. In December 1852, the field was let by public roup as a grass park, and notwithstanding that more than half was in a very rough state, it produced £39. Next year the field was divided by a wire fence, and the rough portion broken up. The portion left in pasture extends to 8 acres, 1 rood, 13 poles, and this was let as a grass park at £18, 6s. 6d. In 1853 this portion was again let as a grass park, when the rent rose to £22, 10s. The portion broken up was generally ploughed, but considerable pieces here and there required to be dug. The land was sown with birley oats, top-dressed with a mixture of guano, gypsum, and saltpetre salt. The crop was sold on foot by public roup, prices ranging from £5 to rather upwards of £7 per acre. After the removal of the oat crop, the rougher portions were deeply dug or half-trenched according to circumstances, and levelled. Part of the field is to be green crop, part oats, this season. The portion of this field in tillage will, in course, be at least equal in quality to the side in pasture. It is deeper land, and better sheltered.

No. 17.—This field extends to 12 acres, 4 poles. Considerable portions of it were naturally dry. It would be worth about £10 per annum prior to 1853. The drainage was precisely similar to that of last field. One crop of oats was taken (1853), and the land sown down. The crop was fair, but very much spoiled before being got secured. After the removal of the oats the field was limed to the extent of, say, 5 tons of shells to the acre. The hay this year was not heavy (say 1½ tons per acre), but fine in quality. The foggage, which was luxuriant, was eaten off with sheep. It was not let, but, compared with let fields, was worth 12s. per acre. The drainage of this field, considering the comparatively limited extent required, was very arduous, owing to the whin rock. Two of the outfalls required to be carried a considerable distance through neighbouring lands. The outlay on this field, including entirely new fencing all round, was very near £100. On the 2d of April 1855 it was let by public roup as a grass park, and produced £22, 10s.

No. 18.—This field extends to 25 acres, 1 rood, 32 poles. Prior to 1853 it was worth about £20 per annum. It came into the hands of the proprietor at Martinmas 1852, when his hands were too full to allow him to attempt complete drainage. He resolved on trying the effect of shallow open drains for one crop, running these exactly on the site of the future drainage. He cut these to about the depth of common sheep drains, removed the earth thrown out to the barer portions of the field, and ploughed across them where ploughing was practicable. Where it was not practicable he dug the land. The plan, on the whole, answered so well, that in like circumstances he would adopt it again. In spring of 1853 he sowed the field with oats, and had quite a respectable crop—spoiled very much however, as a matter of course, by the excessively wet

harvest weather. The oats were rather liberally dressed with guano. Immediately after the removal of the oats, the thorough drainage was commenced. The drains were 5 feet deep where practicable, and 30 feet apart. In many of the swamps they were greatly beyond 5 feet; in the whin rock (with which this field abounded) frequently not over half that depth. As stated in No. 9, when the rock was difficult the water was allowed to drop backwards and forwards from the shallowest point of the drain. In dropping back it fell, as before stated, into a cross drain communicating with an up-and-down drain in which difficult rock did not occur. Two heavy outfalls, extending far into the neighbouring lands, added materially to the expense of the drainage. What with rocks, outfalls, and the enhanced price of labour and materials, the expense of draining, fencing, digging or half-trenching, and levelling, this field approached £320. After drainage a second white crop, partly oats, partly barley, was taken over the greater portion of the field and the land sown down. The barley land was dressed with farmyard manure, the oats partly with lime, partly with guano. About two acres of the field were in green crop, and four acres, after lying fallow, were sown with grasses alone, towards the end of last summer. The whole has now been limed, and several of the wilder portions were, after the removal of the oats, dressed with farmyard manure. The second white crop was quite equal to the average of the district, and the sown grass, especially on the barley land, looks well, considering the severe and long-protracted frost. The turnips were a very bulky crop. In addition to about 40 yards of farmyard manure per acre, they had in one place 3 cwt. guano, and over the rest soot to a similar value. The soot took the lead, but in the long-run the crops could not be distinguished. On the contrary, a few drills sown with about 50 yards of farmyard manure alone were strikingly inferior, both as regarded shaws and bulbs. The green cropped land will be in sown-down barley this season. The increased value of this field remains to be tested, but the proprietor does not entertain a doubt that it will let as a grass park at about £50.

Nos. 19 and 20.—These two fields extend together to 21 acres, 1 rood, 6 poles. They are not yet completed, and the writer does not report upon them farther than to state that, judging from what has been done, the expense of improving them will come to about £180. Their value prior to improvement would be about 30s. per acre or, say, £32 per annum. Their new value, judging from the results produced in other fields, must be at least double that sum, one half of the extent being intended to be irrigated, for which purpose there is ready command of abundance of water.

Without going further into particulars, this may be taken as an outline of the results of improvements carried out in circumstances where neither the soil nor climate was at all favourable.

REAPING MACHINES.

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[Premium—The Gold Medal.]

Although the reaping machine is generally considered a modern invention, and looked upon as one of the wonders of this advancing age, yet we find that it was known to our Celtic forefathers, and it can even be traced as far back as the birth of our Saviour; for Pliny, who wrote about A.D. 40 or 50, thus refers to it:—"There are various methods of reaping. In the broad plains of Gaul, vans of large size, with projecting teeth on the edge, are driven on two wheels through the standing corn, by a horse or ox yoked in a reverse position, by which means the ears are torn off and fall into the van." Palladius, also, who was born A.D. 391, gives a somewhat similar account of this machine, thus proving that it had been continually in use for centuries; for, he says, "In the Gallic lowlands they employ a more expeditious method of reaping, requiring, in addition to the labour of men, the assistance of a single ox during the whole of harvest-time. A cart is constructed, which moves on two wheels; the bottom of it, which is rectangular in form, is protected at the sides by boards sloping outwards, so that the upper part of the vehicle is wider than the lower. The boards in front of the cart being lower than the rest, at that part a great number of teeth, curved upwards, are arranged in a row at intervals adapted to the size of an ear of corn. The ox is yoked by shafts behind, and facing the cart; the driver following and regulating the elevation or depression of the teeth as circumstances require. The corn, being caught by the teeth, is torn off, and falls into the cart; and thus, by a few courses backwards and forwards, the whole crop is gathered in the space of a few hours. This system is useful in open level places, and where the straw is not absolutely required." In the island of Java an instrument is used for reaping grain, called the *áni áni*, which consists of two pieces of sharpened wood, one held in each hand, and when brought together like two knives, sever the ear from the stem, which falls into the basket or apron of the reaper.

The earliest proposal, however, for a mechanical reaping machine in Britain, appears to be that described in the 'Annals of Agriculture,' by Arthur Young, and published in the year 1785, wherein it is stated that the Society of Arts, in the year 1783, offered a premium of a gold medal or £30, for a machine for mowing or reaping grain crops. This was taken up by a Mr Capel Lofft in 1785, and by Mr William Pitt in 1786, both of whom seem

to have acted on the information of Pliny, and, in fact, combined the principle of "*rippling*" with that of *reaping*, leaving the straw to be collected at leisure;—thus showing that improvement in reaping machines, during the 1800 years which had elapsed, was scarcely appreciable. In 1799, another machine was invented, but by whom, it cannot be ascertained; it is described as cutting the grain close to the ground by a number of knives fixed on a wheel, that revolved upon a circular piece of strong sheet iron, to which were riveted a number of steel points. These points were pushed into the standing corn, and served not only to hold it firm whilst being cut, but their sharp edges formed one-half of a pair of scissors or shears (the circulating knife the other half) by which the corn was cut, and, falling on the platform, was swept by a rod—fixed on the axle of the wheel—off the platform, and laid in form of a sheaf out of the way of the next course of the machine. On the 4th of July 1799, the first English patent for a reaping machine was granted to Joseph Boyce of London, for a machine to cut by circular motion, with the power exerted from behind; and in the following year another was granted to Robert Mear, a Somersetshire man. In 1802, mention is made of two machines brought out by a French inventor, but descriptive detail is wanting concerning them, except that "*one* was on the '*rectilinear*' motion—advancing only; and the other on the '*circular*' motion—continuous and advancing." It will be necessary here to mention that, at the beginning of the present century, the circular motion appears to have been much more commonly employed than the rectilinear, and that *swathe-delivery* was generally preferred to the sheaf. The first patent issued in America for a reaping machine was granted to T. I. Hawkins of New Jersey, on 17th May 1803. Mr Plucknett, of Deptford, obtained a patent in 1805; and in 1806, Mr Gladstone produced a machine having an arrangement of parts for gathering the cut corn and delivering it into small sheaves by means of a revolving fork: this machine also cut on the circular principle. In 1807, Mr Plucknett again took the field with his *original* machine, to which was now attached the side-draught and self-delivery apparatus; and, about the same time, Mr Salmon, of Woburn, appears to have brought out a swathe-delivery machine, being the first to which was applied a reciprocating and advancing motion. Up to this time none of the above machines appear to have attained to even a moderate degree of perfection, and were, consequently, scarcely recognised by practical men. Amoug those who next directed their attention to this subject, were Messrs Kerr of Edinburgh, and Smith of Deanston, whose machines were used in the year 1811; they were similar in principle—viz. *rotatory*, with the power applied behind, and consisted of a circular cutter attached to the bottom of a conical drum 2 feet in depth, and 5 feet

in diameter at its lowest part, which, when revolving, cut and laid the corn in a continuous swathe. These machines must have been on an excellent and improved principle, for they became extremely popular in Scotland, where, after being thoroughly tested, they received prizes from the Highland and Dalkeith Societies. The price of Mr Smith's machine was from £30 to £40. During the same year, 1811, two other machines were produced—both of them by Northumbrians—viz., Mr John Common of Denwick, and Mr Donald Cumming of Whitfield. Mr Common invented, but did *not* patent his machine, which he tried on his own crop with every success; and, in the following year, made another with a side-delivery, consisting of an endless web revolving round two rollers; the knife was similar to that on the Hussey principle at present in use. In 1814, Mr Dobbs, a dramatist, exhibited a machine of his own invention in the theatre at Birmingham, where, in acting the part of Robin Roughhead, he worked the machine in character, on a field of wheat planted artificially on the stage. In 1815, Mr Scott, of Ormiston, produced a reaper on the circular-cutting principle, and worked by a side-draught; the circular plate being fitted with a series of small-toothed sickles, which, in revolving, struck against a fixed finger on the scissor principle, but so arranged that, at the point of cutting, the finger and sickle formed an angle of 45 degrees. This system of cutting was the result of numerous experiments, originated for the purpose of discovering the best form of knife, and the most desirable system of applying it; when it was ascertained that the *draw-cut* of the common reaping hook was inferior to none for cutting corn, and especially as it seldom required sharpening; but to apply the *draw* principle to toothed-cutters on a revolving circle, it was necessary that they should form an angle of 45 degrees with the diameter of the revolving circle. Mr Joseph Mann next appeared as the inventor of a machine in 1820, though he did not bring it before the public till 1832; it was also on the circular cutting principle, and delivering the corn in a swathe by means of revolving rakes; it cut a breadth of 3½ feet, and with *one* horse could with ease accomplish 10 acres per day. In 1822, Mr Henry Ogle, of Rennington, invented a machine on the reciprocating-principle; and, in the same year, an apparatus for collecting the corn into sheaves was added by Messrs Brown, of Alnwick. It, however—like most of its predecessors—met with much coolness from the farmers, and opposition from the working-classes, which caused it eventually to be thrown aside. By far the *most* perfect machine of this period was invented by the Rev. Patrick Bell of Carmyllie, Forfarshire, in 1826, to which—after a sufficient trial—the sum of L.50 was awarded by the Highland Society. It was on the reciprocating principle, and propelled by the horses yoked behind and facing

the machine; the delivery was in swathe, which was effected by an endless web, upon which the corn fell, after having received the inclination from a reel whilst being cut. It was tried in numerous instances in Forfarshire, Perthshire, and Fifeshire, in the presence of many landed proprietors and practical farmers, who gave it as their general opinion that, in a short time, it would come into universal use. But although it was thus considered at this date a most efficient machine, it gradually fell into disuse, among the ordinary class of farmers,—the worthy inventor's brother alone clinging to it and continuing to work it from the beginning up to the present day with the most satisfactory results. The writer will again refer to this machine at a more advanced stage of this essay. In 1829, a Russian inventor—M. P. Haüy—appeared in the field with a machine, of simple construction, by which he professed to cut and put in sheaves a field of a *dessiatine* in extent, in the space of ten hours. About this time also an innumerable quantity of reaping and mowing machines—the latter especially—were invented in America, and extensively used and approved of. In 1830, Mr Edward Dudding, of Gloucestershire, obtained a patent for a mowing machine for grass; and in 1833, the famous Hussey's machine—the original from which three-fourths of the machines of the present day have been copied, was patented in America—the cutting apparatus consisting of rows of fixed and vibrating teeth, on the scissor principle. These teeth were 7 to 8 inches in length and 3 inches apart, upon which were cut smaller teeth like those of a saw. The horses walked at the side, and the corn fell on a platform 5 or 6 feet behind and to one side of the frame, whence it was gathered into bundles. In 1834, the equally famous M'Cormick took out a patent in America for *his* machine, the main operating part of which was old; but he claimed *especially* the cutting by means of a vibrating blade (operated by a crank) having the edge either smooth or with teeth, and with projecting fingers for supporting the grain whilst being cut—also, the *separator* for the corn—and setting the *reel-post* behind the blade. In 1839, an Austrian patent was granted to Henry Springer, of Vienna, for a machine on the circular-cutting principle. From this time till 1851, numerous were the machines that were brought out, with varying success, in this and other countries; among the most important of which was one possessing the extraordinary combination of reaping, thrashing, and winnowing—invented by a Northumbrian named Ridley, resident in South Australia. Mr M. Gibson, of Newcastle, took out a patent in 1846 for a machine for reaping corn and cutting grass; and in 1850, Mr Richard Brooman took out an English patent for M'Cormick's reaper. But up to this time,—with the exception of individual cases,—little interest had been taken by the public in the matter of reaping-machines, from the fact that neither the requirements of the farmer,

nor the prospect of pecuniary reward to the agricultural implement makers, were of such a nature as to promote the development into a practical form, of what were really—as in the case of Bell's and Smith's—valuable inventions; and it was not until the Great Exhibition of 1851, which afforded such a golden opportunity for the display of many rare and ingenious inventions,—chiefly contributed by our transatlantic *friends*,—that our farming magnates, backed by the most eminent implement makers of the day, began to consider it a suitable occasion for filling up that void which had been so long *un*occupied in our British harvest fields. Among the numerous machines—full-sized and models—there exhibited, were *two* which attracted especial attention,—viz., M'Cormick's and Hussey's, and which must be considered as the *basis* upon which all other machines (Bell's excepted) have been invented, with various modifications and improvements, since that period. Both of these machines were on the side-draught (horses abreast) and sheaf-delivery principle, requiring a man to ride upon the machine and deliver the corn by means of a rake, in bundles of a sufficient size for a sheaf. The driver also of M'Cormick's rode upon the machine, whilst that of Hussey's rode on the near-side horse; but the great difference between these two machines existed in the cutting-apparatus. In M'Cormick's machine, the knife had a serrated edge, the numerous blades being riveted on to the bar in the form of an *obtuse angle*, consequently its action was similar to that of a *saw*, but it required the aid of a revolving reel to hold the corn firm whilst being cut. It was more durable, more easily worked, and less liable to choke than Hussey's. In Hussey's, the knife was on the scissor principle (the finger-guards being the fixed half of the scissors), and formed a very *acute* angle; it was smooth-edged, sharp, and chopped the straw by a rapid motion through and against the fingers, but, unless driven at a considerable speed, was liable to choke. A friend of the writer of this essay, who worked one of these machines in America for several years, informs him that it was no uncommon practice to have the horses going at a sharp trot during the whole day, to prevent this choking—of course having relays of men and horses. This form of knife required very frequent sharpening, though it was independent of the aid of a reel. Hussey's machine was, for several years subsequent to this date, manufactured by Dray & Co., of Swan Lane, London, and was usually known by the name of Dray's Hussey. In addition to the *two* above described, Messrs Garrett also contributed a machine, the invention of Mr Tolemache, M.P., which possessed the advantage of delivering the corn at the side, whilst the horses were yoked one before the other. The numerous models also exhibited were by Messrs Blakie of Glasgow, Taylor of Bury, Mackay of Swansea, Fairless of Corbridge, Trotter of Bywell, Winter of Ingram Court; and several

others. . . . . . Many attempts have been made to do away with the reciprocating principle in the cutting apparatus, and to substitute a continuous motion,—the reverse action of the former being a source of considerable loss of power,—but, so far, without success. However, as far as the actual cutting is concerned, there does not appear to be much to object to, inasmuch as it has now been proved, that a vast variety of crops can be cut in a most satisfactory manner by the present system. It must also be a matter of surprise to many, that nearly all inventors and improvers of reaping-machines, have turned their attention almost exclusively to the cutting apparatus, unmindful of the delivery, which has been the great difficulty of bringing them into practical use; and whilst considering this subject, it is a cause for self-congratulation to us, that though mainly indebted to the Americans for the *cutting* apparatus, we have eclipsed them in the *delivery*. The progress made in the improvement of reapers, since 1851, has been perfectly marvellous; and it is not an exaggerated statement, to affirm, that the patents granted for the improvement of these machines, from that period to the present time, amount to upwards of *four hundred*. Not the least important improvement is the adoption of a serrated-edged knife, in the place of a smooth-edged clipper in Bell's machine, by Mr A. Crosskill, in 1854; the beautiful application of the Archimedian screw-delivery to M'Cormick's machine, by Burgess & Key, in 1854, as well as the "conical screw-divider," in 1857, and the "spring hinge," in 1859;—the "revolving bands" of Lord Kinnaird, applied to M'Cormick's machine, to produce a swathe-delivery;—and the self-acting sheaf-delivery, by M'Cormick and Samuelson, on the Automaton principle, &c. &c. Having thus far traced the history of the reaping machine, it will be necessary, before proceeding further, to mention some of the most prominent parts and conditions which constitute this machine—after which will be given, seriatim, a description of the various machines in use at the present day.

The chief point of difference among the reaping machines generally in use, exists in the *three* following cardinal divisions, viz.:—

I. The Cutting Apparatus.
II. The Mode of Delivery.
III. The Method of Draught.

I. *The Cutting Apparatus* is of two kinds, each consisting of a cutter-bar, upon which is riveted a number of blades, either in the form of an *obtuse* or an *acute* angle.

(*a*.) An *obtuse*-angled cutter is also serrated, or sickle-edged,  and works independently *through* the guard-fingers (of the finger beam), which precede and clear away any

obstacles that may occur in its course, and at the same time firmly grasp the standing corn between them. This form of knife is simple, effective, durable, seldom requires sharpening, and consumes less power than any other form, owing to its action of *sawing* rather than clipping its way through the standing corn; but at the same time it requires the assistance of a *reel* to counterbalance the pressure *below*, and give the corn an inclination towards the platform. This style of knife was introduced into this country by M'Cormick, and has since been applied to most of the *large* machines in use at the present day.

(*b.*) An *acute*-angled knife differs from the above in being on the *clipping* or *scissor* instead of the *saw* principle; the finger guards forming the fixed half of the scissors, and the blade the moveable half. This form of knife  frequently requires sharpening, and does not work so easily as the obtuse-angled knife, but, generally speaking, cuts somewhat more level, and has some advantage over it when the corn lies away from the machine, whilst it will also cut grass equally as well as corn. The Hussey class of machine uses this kind of knife, which may be either serrated or plain.

II. *The Mode of Delivery* divides itself into *two* grand systems, viz.:—

1. Manual Delivery.
2. Mechanical Delivery.

Manual Delivery may be again subdivided into *back* and *side* delivery.

(*a.*) When the delivery is effected at the *back* of the machine it affords great ease to the raker, whilst in a heavy crop it may be considered as the only really practicable system of manual delivery. It is much assisted by a well-constructed *divider*, or tipping platform, which enables the raker to turn off a very neatly-formed sheaf. It has this disadvantage, however, that the sheaves must be either tied up or moved prior to the next round of the machine.

(*b.*) The manual *side* delivery is not so popular with those who work reapers as the above, as the labour is severe, and the delivery by no means so neat when the corn is at all heavy or twisted, from the fact that the tipping process cannot be applied; the labour, however, is considerably diminished by the assistance of two or three small radiating rollers attached to the platform, as in the case of Palmer's machine, which is now extinct.

Mechanical or Self-delivery, in conjunction with a satisfactory cutting apparatus, produces the nearest approach to perfection in a reaper. This system is effected in two ways: either in the form of a *swathe* or of a *sheaf*.

(*a.*) *Swathe delivery* is accomplished either by an endless web or bands—as in Bell's, Lord Kinnaird's, &c.—or by means of archimedian screws, as in Burgess and Key's. In either case these appliances are driven at considerable speed, and catch the corn as it falls on the platform, depositing it on the ground in a continuous swathe at one side, and at right angles to the course of the machine, and therefore out of the way of the horses in their next round. The delivery by *bands* is not well adapted for short corn, especially when damp or full of clover or grass, though it works admirably in a nice standing average crop; whilst Bell's machine has also the advantage of being able to deliver its swathe at *either* side of the machine. The *screw* delivery is the most popular for general purposes, *i. e.*, taking into account the varying nature of the ground and crops on which reapers generally have to operate.

(*b.*) The *mechanical delivery* of corn in the form of a *sheaf* has been a *desideratum* long felt by the farmer, and many attempts have at different times been made to meet it by Messrs Samuelson, Ransome, and others, with varying success; but, as the Exhibition of 1851 was the means of introducing the reaper to this country in a *practical* form, so that of 1862 has brought out this much-desired improvement in the shape of an automaton rake, which sweeps the sheaf from the platform without further manual assistance; whilst it is generally admitted to be vastly superior to any *manual* delivery in the certainty, rapidity, and completeness with which it works, where a fair standing crop and other circumstances admit of its use. Two of these machines were at work during the past harvest (1862), *one* by the famous M'Cormick, and the other by Samuelson, both of which will be hereafter noticed in this essay.

III. *Method of Draught.* The majority of reapers are on the side-draught principle, Bell's alone being propelled by the application of the power behind. Each has its advantages, though popular feeling inclines towards the former, from the fact that the power required can always be proportioned to the work by attaching as many horses as are necessary, whilst in the latter case no *additional* power can be applied. *Mechanically* speaking, the *square* draught or propelling system *may* be correct, though not so applicable to *general* reaping purposes. It requires a steersman to walk behind the horses and guide the machine—a post of much difficulty where there are numerous turnings, or when working on ridge and furrow. It has its advantages, however, in cutting its *own* road into a field without further assistance, and delivering the cut corn to either side as required.

To simplify the description of the machines in use at the present day, and to render it as intelligible as possible, the writer

proposes to treat them under *two* heads, according to their system of delivery—viz.:

I. *Mechanical Delivery,* including Bell's, Burgess and Key's, Lord Kinnaird's, M'Cormick's, Samuelson's, Kemp, Murray, and Nicholson's, Ridley's, &c.

II. *Manual Delivery,* including Picksley and Sim's, Gardner and Lindsay's, Kemp, Murray, and Nicholson's, Burgess and Key's, Cuthbert's, Trotter's, Jack and Son's, Brigham and Bickerton's, Wood's, Wray's, Samuelson's, &c.

I. Mechanical Delivery.

(*a*.) *Bell's* machine, as has been previously mentioned, is the only one of early introduction which has not gone out of use; but was even employed on a farm in Scotland till 1852, when Mr Crosskill of Beverley undertook the manufacture of it, and improved upon it considerably, in replacing the old-fashioned shears or scissors by the sickle or serrated-edged knife. It is on the square draught or propelling principle, by means of a long pole passing between the *two* horses, which are yoked to the end of it, and which also serves as a steerage for the attendant. The delivery is effected by means of a number of endless bands of vulcanized India-rubber, fitted with projecting pieces of wood, which carry and deposit the corn on the ground in a regular and continuous swathe. The objection which formerly existed in not being able to apply additional power when required, has now been removed by Crosskill manufacturing a *three*-horse machine, cutting a width of 8 feet 3 inches, in addition to his *two*-horse machine, cutting 5 feet 9 inches, the former at L.37, and the latter at L.32. This new three-horse machine, which was brought out in 1860, was an improvement to such an extent as—when compared to the *old* two-horse—to reduce the weight, draught, and price 25 per cent. This *extra* width, however, has *one* disadvantage—viz., in delivering the corn in *too* large a swathe, and consequently produced a difficulty to the sheafers and binders who have to follow; besides, preventing the sun from drying it to the extent that it would otherwise do if delivered in a less bulky form. In this *three*-horse machine the horses are yoked by means of shafts instead of a pole. Although the most convertible, it is a somewhat unwieldy machine, and seems best suited to the large fields of the wolds of Lincolnshire and Yorkshire, where ridge and furrow is unknown, and where fair *standing* crops are grown. Its draught is $29\frac{8}{11}$ stones, cutting full width.

(*b*.) *Burgess and Key's* machine is, as before stated, an improvement on the original M'Cormick by the addition of the Archi-

medean screw and other parts. It is self-acting, cutting and laying the corn in a continuous swathe at the rate of $1\frac{1}{2}$ acres per hour. A boy or man seated upon the machine drives the two horses which draw it, though it is advisable to attach a *third* horse to the end of the pole in case of heavy crops; or in barley; not so much for the purpose of draught as for steadying the machine. The horses walk at the side of the standing corn, and in advance of the knife, which runs out from the wheel frame on the left side. The principal part of the weight is balanced over the one main or driving wheel, which gives motion to the knife for cutting, the reel for inclining, and the Archimedean screws for delivering the cut corn in a continuous swathe. The cutting apparatus is M'Cormick's, which is similar to the one used in Bell's machine, being simple, effective, durable, not liable to choke, and consuming less power than any yet introduced. The corn when cut falls upon a series of Archimedean rollers, by which it is carried off to one side, and deposited in a well-formed swathe at right angles to the course of the machine, and out of the way of the horses; thus allowing a field to be entirely cut without binding or otherwise moving the swathes. The revolving cone at the side of the machine acts as a *divider*, separating the corn being cut from the standing crop. The height of cut may be varied several inches whilst the machine is in motion, by means of the lifting gear attached to the land-wheel. The hinge-side is an important appendage in enabling the machine to turn at any angle without injury to the soil or young clover, &c., as well as greatly facilitating its passage through gateways. It takes a width of 5 feet 8 inches, and will cut on an average from 12 to 15 acres per day. The writer has used *one* of these machines for the last *five* years, during which period *it* has cut upwards of 1200 acres on this farm, in addition to upwards of 200 acres cut for hire; and this leads him to speak most favourably of the material of which this machine is made, and of its proverbial durability, as well as of its careful construction. The knife will cut from 50 to 70 acres without requiring sharpening; whilst the machine, *with proper adaptation*, will deliver the *shortest* oats equally as well as the heaviest crop of wheat; a fact to which the writer can testify. Its price is L.36.

(*c*.) *Lord Kinnaird's* machine consists of M'Cormick's cutting parts, with the addition of his Lordship's patent delivery, which is, by means of endless bands passing over a smooth surface, similar to Bell's. The horses work at the side, one before the other, the latter being yoked to shafts, which gives the driver a great command of the machine. This is in every respect a first-rate machine, though it is scarcely so popular as it used to be, owing to his Lordship having unfortunately placed it in the hands of a careless maker after the death of his own smith; this, however, is now obviated, and more will be heard of this machine hereafter un-

doubtedly, as it possesses many important characteristics. It is simple and easy of draught, and will cut on an average 1 acre per hour.

(*d.*) *M'Cormick's* machine differs from the *three* preceding, in delivering the corn in the form of a sheaf instead of a swathe, and was introduced into this country in 1862 through the medium of the International Exhibition. It is a marvellous improvement on *his* of 1851, being of lighter draught; whilst an iron finger-beam has been substituted for the old wooden one, with smaller and more penetrating teeth, thus better adapting it to cutting grass. But the most distinguishing characteristic of this machine is its automatic delivery of the cut corn in the form of sheaves at one side, and out of the track of the horses in passing round, without being bound or otherwise removed—this operation being entirely performed by a driver with his team of horses, and more perfectly than could possibly be done by manual labour. This automatic delivery consists in certain arrangements of mechanism, in which a rake is used, and has motion given to it, so that during one part of the revolution of the gathering reel the rake acts as one of its vanes, in bending the standing corn towards the cutting blades. When the rake reaches the cutting blades in front of the platform, it ceases to revolve *around* the reel shaft (which continues its rotary motion), and is made to move *horizontally* upon a vertical hinge, to which one end is attached (the points of the teeth being near the surface of the platform over which it passes), sweeping the cut corn off at the side, and depositing it on the ground in sheaves ready for the binder. Motion is then given to the rake, causing it to rotate around the shaft of the reel; and it is brought into a line with the reel-shaft at that part of its revolution when it again begins to act as one of the vanes of the reel. The mechanism by which these operations are controlled is simple and durable, consisting of a roller, guided by an eccentric or cam, and the necessary parts to attach the rake. In other parts it is similar to the *original* machine, whilst all the parts where there is any strain in work are made of wrought iron. Its price is L.34; and it may be here mentioned that Burgess and Key (the manufacturers of this machine), are about to introduce a combined machine, in which *either* the automaton rake for sheaf-delivery or the archimedian screws for swathe-delivery may be used, as crops and other circumstances require.

(*e.*) *Samuelson's* machine is somewhat similar to the above in being self-acting, and delivering the corn in the form of a sheaf. The present (1863) form of the machine is a great improvement on that used during the harvest of 1862. The self-delivering machinery *now* consisting of a series of *four* (formerly *six*) rakes attached to an upright shaft in such a manner as to admit of a free ascending, descending, and horizontal motion. Two of these

rakes are simply "*dummies*" for drawing the corn down towards the knife, whilst the other two are rakes *proper* for drawing the corn towards, and also delivering it off, the machine in sheaves. Upon the upright shaft to which the arms are attached, is a solid disc wheel placed horizontally, and this is actuated by another disc wheel of similar construction, placed vertically, and deriving its motion from a pitch-chain in connection with the driving-wheel. The platform is of quadrant shape, the outside edge being surrounded by a rim about 1 foot in depth. "To insure the rakes passing over the platform on the level and not obliquely, as their angular attachment to the upright shaft would imply, a nearly circular iron-hoop, from 3 to 4 feet in diameter, passes round the upright shaft. Upon this, as a *cam*, small iron rollers, placed upon the shafts of the rakes, revolve. The under side of the cam is bent or depressed, so that the rakes, on reaching this point, immediately assume the horizontal attitude necessary to sweep over the platform on the level." By this means the sheaves can be laid as near together as 12 feet. A double-throw knife has recently been added to this machine, which will have the effect of considerably reducing the driving speed, whilst an ingenious contrivance has also been applied for raising and lowering the knife; the gearing has also been raised during the past year, which will prevent clogging on soft land or in passing over ridges. Its price is £38, delivered at any railway station.

(*f.*) *Kemp, Murray, and Nicholson* introduced a machine during the latter part of the past harvest (1862), in which was applied a self-acting sheaf-delivery apparatus to the ordinary "improved Hussey." It consists of a self-acting tipping platform, and a revolving reel with four arms, one of which is longer than the others. At the time when this long arm comes in contact with the grain which has just been cut and laid on the tipping-board, the latter instantly falls down, leaving the cut grain in a well-formed sheaf at regular intervals behind the machine. As soon as the tipping-board has thus deposited the sheaf on the ground, it instantly resumes its former position, and the same process is repeated continuously. One attendant only is required to drive the horses and manage the machine; the size of the sheaf can be regulated at will. It is of simple construction, easily managed, and moderate work for two horses; whilst in a nicely-standing crop it turns off a very neat sheaf. During the past harvest, its trials—though limited—were satisfactory to all who witnessed them. Its price is £28.

(*g.*) *Ridley's* machine is the one already alluded to as possessing the strange combination of reaping, thrashing, and winnowing; and was invented to meet the requirements of a tropical climate, like Australia, where the grain is fit to thrash as soon as cut, and the straw of little value. This machine—taken from the idea of

Pliny—consists of a comb or row of spike-like bayonets, about 2 inches wide, $\frac{1}{10}$th of an inch apart, and 12 to 14 inches in length. In being propelled through the corn it catches the ears, which are rippled off and fall into a hopper, where they are caught by four revolving beaters of about 20 inches in diameter, and thoroughly thrashed. One of these machines was exhibited at the International Exhibition last year, and it was also tried in Northumberland, with an application for cutting the straw as well, with questionable results; in fact, our uncertain and damp climate will be sufficient to prevent its extended use in this country.

II. Manual Delivery.

(*a.*) *Picksley and Sim's* machine, which is the patent of Mr Bamlett, stands prominently forward among the most improved and popular manual-delivery machines. It may be described as running upon *two* wheels, having also a guard-wheel or castor a little in advance of the knife, to prevent the latter from running into the ground when passing over ridge and furrow. The knife is on the clipping principle, and is attached to a vertical vibrating bar, which relieves it from friction, and allows a much freer action; whilst its position is adjusted by means of a lever and rachet motion being given to the knife by a self-acting lever-clutch in connection with the driving-wheel. The fingers are of wrought iron and the finger-bars of steel, and it cuts a width of 5 feet 3 inches. The grain, when cut, falls upon a patent-jointed platform which is supported by a spring that gives way to the weight, when the former has accumulated in quantity sufficient for a sheaf, on the principle of a self-tipping platform; and thus the labour of the raker, who rides on the machine, is considerably lessened. The delivery is usually at the back, but a side delivery can also be attached. It is strong, compact, durable, and of extremely light draught; the latter only amounting to $14\frac{8}{11}$ stones, which is due to the use of a large portion of cast steel, which thus secures to it both strength of material and easiness of draught. This machine made a most successful *début* at the Royal Agricultural Society's trial at Leeds in 1861, where it gained the *First Prize* in Class 2; since which period it has been used with most satisfactory results in the Lothians and other parts of Scotland, where it has been able to "hold its own" against the machines of several eminent Scotch makers; a fact which tells not a little in its favour. Its price is £25.

(*b.*) *Gardner and Lindsay* were among the first to attempt improvement on the "original Hussey," in which they so far succeeded as to produce a machine that, up to this period, has been unequalled in popularity through the whole of Scotland; in support of which, it may be mentioned that no less than 6151 acres

of corn were cut by 119 machines of this make alone in East Lothian during the harvest of 1860. In addition to the *two* travelling wheels, this machine has also a front wheel or castor to guard the knife over furrows and water-cuts;—the finger-beam and platform are also hinged and folding. It is a well-made machine, though somewhat heavier in draft than the preceding machine, and makes a considerable noise in working, which is very objectionable; at the same time, it is a most useful machine for small farms, and fully merits the praise it has received. Its price is £22. Messrs Brown and Young of Stirling have recently undertaken the manufacture of this machine.

(c.) *Kemp, Murray, and Nicholson's* machine may be said to have had an almost equal run of popularity in Scotland with that of Gardner and Lindsay, having a large share of admirers also in other countries. It is on the Hussey principle also, the improvements effected upon which consist in having increased the diameter of the driving-wheel, as well as of the off-side travelling wheel, which has also been made somewhat *convex*, to prevent the cutting up of the land, and lifting of the soil. The speed of the knife has also been increased so as to allow the horses to walk at an ordinary pace. An efficient leverage to regulate the height of cut and raise the finger-beam in passing over furrows, which can be easily managed by the man riding on the machine, has been added; as well as a new spring leverage for putting the machine *in* and *out* of gear, which can also be managed by the same individual. The more recent improvements, however, apply to the cutting apparatus, in which the finger-bar is *now ribbed* or *flanged*, so as to increase the strength where most required, and prevent springing or bending; whilst at the same time the knife-bar receives a greater freedom of action and less liability to choke, and the draught is considerably diminished. The knife bars are of the best shear steel, and the fingers made so as to prevent choking in a damp grassy bottom. It cuts a width of 5 feet 3 inches. When cut the grain falls upon a platform—made to swing on a centre—and is tipped up by the raker's foot, when it has received sufficient for a sheaf; which process, in conjunction with a slight assistance from the rake, effects a neat and clean separation of the grain, and a tidy sheaf. This tipping-board has been recently much improved by being diminished in breadth, and set at a greater angle, which has the effect of preventing any straggling, and still lessening the labour of "putting off" the sheaf. Up to this time it has been drawn by two horses abreast, by means of ordinary chains and whippletrees, with a *break* for using in hilly districts; a *pole* has now, however, been introduced and attached at the point immediately above the wheel carrying the front of the machine. This pole is not rigid, but can rise and fall, and turn with the front castor-wheel, which is much easier for

the horses than a *rigid* pole. Among other honours reaped by it in 1862, was the prize medal of the International Exhibition. Its price is £23. This firm also manufactures a *one-horse* machine, cutting a width of 4 feet 3 inches, at a cost of £20.

(*d.*) *Burgess and Key*—in addition to their self-delivery—also manufacture a manual delivery machine, which, during the past two or three years, has become as great a favourite on small and medium-sized farms, as the *former* is on the large ones; possessing, like it, the desirable combination of power, durability, lightness of draught, excellence of material and beauty of finish, which at once stamp it—a *superior* machine. It differs from some of the others of this class in being driven from *both* travelling wheels which are in *advance* of the finger-beam, whilst the castor or *guard* wheel is *posterior* to it. It takes a cut of 5 feet in width; the finger-beam—like some others—being on a hinge, which enables the whole machine to be packed in a very small compass for travelling from field to field, as well as allowing it to suit the inequalities of the ground. Besides a tipping-platform, it has also a *conical screw* "driver," which revolves inwards, and is driven simply by the weight of the corn; this not only separates the standing from the cut corn, but also draws the latter towards the raker, and is thus a considerable assistance in the delivery. The horses walk abreast, and are yoked to a pole. Its price is £30. The writer can speak most favourably of this machine as a grass cutter from actual experience with it; whilst its action of cutting and process of delivery of grain crops is admirable.

(*e.*) *Cuthbert* of Bedale was also one of the few who early commenced to effect improvements on Hussey's patent, producing a machine with which he has for several years deservedly received a large share of patronage throughout the united kingdom. Like other improvers on Hussey, he increased the diameter of the travelling wheel, and suspended the cutting-bar by a *sling*, so as to relieve it of a considerable amount of friction, which was previously found to waste much power; the speed of the knives is consequently much less, and the stroke much longer than in the original. The drivers can alter the *dip* of the cutters by means of a screw attached to the shaft, which *latter* are used instead of a pole, to give greater steadiness of draught. One horse works the back delivery, and two horses the side-delivery machine. Its cutting is excellent, taking a width of 4 feet 5 inches, with a draught of 18½ stones; and whilst its price is so moderate—£22—it is easy to imagine it being a great favourite with the farmers generally.

(*f.*) *Trotter's* machine is also on the scissor-cutting principle, delivering the corn behind by a tipping platform, and having—like several others—a universal hinge between the body of the reaper and the cutting frame. Its great peculiarity, however,

consists in a *fly-wheel*, which is of immense importance in steadying the action of the reciprocating cutters, and economising the power by retaining it in momentum. It is fitted with two travelling wheels of large diameter, which faciliate its transport; and it is an interesting fact, not generally known, that *this* was the first machine of the kind to which *two* travelling wheels were applied. It has also a small castor wheel for carrying the finger-beam over obstacles and inequalities of the land; whilst it can be backed with the greatest ease, without the cutters working. For *undrained* land or ridge and furrow, the writer prefers it to any other manual delivery reaper yet introduced. Its price is £26, 10s.

(*g.*) *Jack and Son* of Maybole commenced the manufacture of reapers in 1859, by improving upon Hussey's pattern; since which period, by annual additions, they have so far succeeded as to have established a reputation as the makers of one of the best machines of the day. Their improvements have been chiefly in detail, which have all conduced to furnish a machine of extremely light draught, and at the same time of sufficient strength. It takes a cut of 5 feet 4 inches in width, the corn being delivered at the back, by the conjoint action of the raker and tipping-platform. A large castor wheel runs in front of the machine and immediately behind the horses, which is of service in assisting the turning of the machine on the headlands, as well as in regulating the height of cut. Its price is £24.

(*h.*) *Brigham and Bickerton's* "Buckeye" reaper has now become a name familiar to the agriculturists of the north of England and Scotland; whilst the rapidly increasing number of machines which have been annually sent out since its introduction in 1860, is at once significant of its great utility and the satisfactory results obtained from it:—

In 1860,	there were	16	machines sold of this make.
„ 1861,	„	69	„ „
„ 1862,	„	194	„ „

This is also on the Hussey plan, with a hinged cutting-bar and a hand-lever to raise it, with also a platform of the ordinary form. It is of unusually light draught, and exceedingly portable; the only objection to it in the opinion of the writer being, that some of its parts are almost *too fine* for heavy and strong work. *This*, however, is *now* being remedied by the makers substituting stouter material where required. It is made for any width of cut, from 3 feet 8 inches to 5 feet 2½ inches, at a price varying from £23 to £26. The recent improvements effected in this machine consist in having lengthened the cutting-bar *for corn* to 5 feet 2½ inches; and as it is a combined machine, a separate cutting-bar of 4 feet 8½ inches is also provided for grass cutting. In addition to this a new lever for raising the cutting-bar has been lately adopted.

(*i.*) *Wood's* machine, though at one time much admired, is not so popular at the present day, owing, it is presumed, to the inferior quality of the material of which it is constructed, the iron evidently being of a different composition to our English iron. The writer of this having extensively used one of these machines for grass-cutting (a combined reaper and mower), his experience *compels* him to speak *thus* of its construction, having found a great difficulty in welding the iron with English iron in case of a breakage. At the same time it has many good points to recommend it,—the chief of which is its lightness of draught; it has a reel also—a somewhat unusual feature in a manual-delivery machine—to assist the delivery. It will cut a width of 4 feet 10 inches, and its price is L.35. An attempt has been made to convert this into a self-sheafing machine, but so far without success.

(*j.*) *Wray's* machine is on the Hussey principle also, but driven by a patent worm shaft, and though very simple and quiet in its working, as compared with other machines driven by multiplying wheels, and consequently likely to attract the favourable attention of the *non-mechanical* farmer, it is mechanically a *mistaken idea;* being both a waste of power, and a source of great wear and tear. It takes a 5 feet cut, and costs L.22.

(*k.*) *Samuelson's* "Patent Eclipse" is a one-horse machine, and remarkable for its simplicity of construction, lightness of draught, and moderate price. There is an entire absence of gearing about it, the driving wheel by means of a level pinion communicating the motion direct to the knife. It has also a tipping platform, and its price is *only* L.16, 16s. Samuelson also manufactures a two-horse machine of no mean merit, at a cost of something over L.20.

It may not be out of place here to remark that the machines in the above class—in fact *all* machines on a *clipping* principle—come under the category of Grass Mowers, and are ordinarily used as such; a special mention of them, however, under this head, does not come within the province of the present report.

In addition to the foregoing detailed description of some of the most popular reaping machines of the day, many others of less notoriety—though of great utility—might have been noticed; however, the writer presumes that what he has already given will suffice to meet the requirements contained in the conditions for this report; he will therefore proceed by offering a few remarks on "The Record of the principal Trials of Reaping Machines."

Assuming that the trials which have taken place within a comparatively recent date, will *alone* be of any value or service to the public, the writer proposes to commence with the year 1851—the period when the Reaping Machine may be said to have first fairly attracted the attention both of farmers and manufacturers, and to

have taken its stand as an indispensable supplement to the implement yard of the British farmer.

(*a.*) 1851.—The first trial to which the writer will refer, was one that took place at Tiptree Hall, under the patronage of the Royal Commission of the Exhibition of 1851, where the Council Medal was awarded to M'Cormick's machine — Hussey's machine neither meriting nor receiving such distinction. Mr Pusey, in drawing up the report of this trial, thus alludes to it:—"It cut the wheat about 8 inches from the ground with the utmost regularity, at the rate of $1\frac{1}{2}$ acres per hour; it was light work for the horses, though somewhat severe for the raker." After remarking on the economy and advantage of using the reaper, he concludes by characterising it as "the most important addition to farm machinery that has been invented since the thrashing machine took the place of the flail." (*b.*) The writer of this essay had also an opportunity of witnessing a trial of this machine during the same year, at Hackthorpe Hall, on the Earl of Lonsdale's estate in Westmoreland, in the presence of a large concourse of farmers, who universally admitted its capabilities.

(*a.*) 1852.—At the meeting of the Royal Agricultural Society at Lewes, the Judges awarded the *first prize* to a Hussey machine, manufactured by Garrett, "which did its work with remarkable precision," under circumstances (dry and hot weather) most favourable to its action; whilst M'Cormick's machine was placed *second.* (*b.*) During this year, other trials of importance took place, such as that of the Royal Agricultural College at Cirencester, which lasted several days, during which upwards of 100 acres of grain were cut, and resulted in favour of M'Cormick's machine. (*c.*) At the Yorkshire Agricultural Society's trial at Sheffield, M'Cormick was again victorious; as he was also at Driffield—the Judges observing that "as regards power, speed, efficiency, and apparent durability, M'Cormick's machine was far superior to Hussey's." (*d.*) At the Cleveland Agricultural Society at Guisborough, Garrett's Hussey carried away the prize of 20 guineas, leaving M'Cormick, Dray, Wray, and an original Hussey—*commended.* (*e.*) At the Highland Agricultural Society's meeting at Perth, the prize was awarded to *Bell's* in preference to any of the above.

1853.—At the Royal Agricultural Society's trial at Gloucester, there were *twelve* competitors in the class of reapers, including, in addition to those above mentioned, two with automatic delivery. Out of this number, *six* were selected for an adjourned trial at Pusey, at a later period of the same year, when Crosskill's Bell was placed *first,* with the M'Cormick and Hussey respectively *highly commended* and *commended;* the Judges remarking a decided improvement in the working of these machines over last year.

1854.—At the Lincoln meeting of the Royal Agricultural Society, Mr Hamond reports an improvement in the manufacture of reapers generally, and gives a preference to Dray's Hussey, with a tipping-platform and back delivery. He considers side-delivery *in swathe* a great desideratum, but does not regard it as satisfactorily accomplished by Bell, owing to the excessive horse-power required.

(*a.*) 1855.—The trial of the Royal Agricultural Society was this year adjourned from Carlisle to Leigh Court, near Bristol, at which the writer was present. Burgess & Key's screw-delivery (attached to M'Cormick's machine) made its début here, and fairly distanced all competitors, receiving the *first prize*, and the high commendations of all who saw it at work. The *second* prize was awarded to an improved Hussey, by Palmer of Stockton, in which the delivery was effected at the side by means of small radiating rollers fitted at intervals on the platform, and which were of considerable assistance to the raker. *Dray* was *highly commended.* More rapid strides had been made in the improvement of reapers during this year, than had ever before been noticed.

(*b.*) At Stirling, N.B., Crosskill's Bell and Dray's Hussey carried off the honours in their respective classes.

(*c.*) The Paris Exhibition also afforded on occasion for the trial of reapers, which came off at Trappe, and resulted in M'Cormick receiving the "*Grand Medal of Honour.*" The time occupied in cutting a given quantity of grain, stood thus:—

M'Cormick	cut	2000	metres in	17.00	minutes.
Manny's		"	"	27.36	"
Atkin's		"	"	27.69	"
Dray's		"	"	31.11	"

1856.—The Royal Agricultural Society held its trial at Boxted Lodge, when the L.50 prize money was divided as follows:—

£20 to Crosskill's Bell, for general harvest purposes.
£15 to Dray's Hussey, for reaping wheat crops.
£15 to Burgess & Key, for general purposes.

The position of Crosskill and Burgess and Key were thus reversed; but although this was the result of this particular trial, the decision did not appear to be endorsed by the *English* public, who had evidently taken a great fancy to the *screw* delivery, from its satisfactory appearance at Leigh Court. Since the previous year, however, Crosskill had substituted in his delivery gutta-percha bands instead of the endless web, which tended greatly to reduce the friction and diminish the draught: there was no other great improvement.

Name of Exhibitor.	Time at work.		Quantity reaped.		
	hours.	mins.	acre.	roods.	poles.
Dray's Hussey, ...	1	40	1	2	27
Croskill's Bell, ...	2	5	1	2	23
Burgess & Key, ...	1	53	1	1	16

1857. Salisbury being the place selected for the Royal Show of this year, the trial of reapers also took place here, when the *first prize* again reverted to Burgess and Key; the *second* to Crosskill's 'Bell;' and the *third* to Lord Kinnaird. *Commendations* were also appended to *three* other (sheaf-delivery) machines; the feeling of the public this year evidently being much in favour of *swathe* delivery.

1858. No trial of reapers under the auspices of the Royal Agricultural Society came off this year, neither were there any others of much importance.

1859. Again 'The Royal' had no trial; therefore the results this year obtained are from trials which took place under less important patronage. (*a.*) Among these, that of the Manchester and Liverpool Society, which was held to mean the latter place, resulted in favour of a Wood's machine—three others of similar make and one of Dray's also competing.

(*b.*) An important trial near Paris took place early in the harvest of this year, where—

The First prize of £40 and Gold Medal was awarded to Burgess & Key.
... Second ... £20 and Silver Medal ... ... Cranston's "Wood."
... Third ... £12 and Bronze Medal ... ... Roberts & Co. (Paris), for Manning's reaper.

During this competition it was observed that the superiority of Burgess and Key's machine was unquestionable.

(*c.*) At the north Northumberland trial at Bilton, under most unfavourable circumstances, the first prize was divided between *two* of Burgess and Key's machines, whilst the second prize went to Cuthbert and Stokoe.

(*a.*) 1860. The trial of the Royal Agricultural Society took place this year at Canterbury, where several of the best known machines came forward; the award, however, quite reversed the decision of previous years, by the *first* prize being given to Cuthbert's Hussey, and the *second* to Burgess and Key.

(*b.*) At the Dumfries trial of the Highland Society, the machines were arranged in *two* classes—viz., *self-delivery* and *manual deli-*

very—in the former, the *prize* was awarded to Lord Kinnaird; and in the latter, the *first* prize went to Gardner and Lindsay, the *second* to Jackson, and the *third* to Trotter.

(*c.*) At the North Lincolnshire trial, near Horncastle, Cuthbert's was placed *first*, whilst Wood's, Spencer of Doncaster, and Burgess and Key, were also competing.

(*d.*) At the Yorkshire Society's trial at Pontefract, no fewer than eleven reapers made their appearance, including Spencer's, Wray's, Cuthbert's (three), Cranston's, Wood's, Kearsley's, Bamlett's, Coates', Beckwith's, Heugh's, and Burgess and Key's—the Judges awarding the *first* prize to Cuthbert, and the *second* to Beckwith; whilst the general feeling of the public seemed *also* to be in favour of small and cheap machines.

(*e.*) One of the most interesting and important trials of this year took place at Longniddry, in East-Lothian, when *ten* machines came to the mark. The following is the time occupied by each machine in cutting *an acre*:—

No.	Name of Exhibitor.	Width of Cut.		Wheat.		Barley.	
		ft.	in.	hs.	mins.	hs.	mins.
1	Mr Durie (Crosskill's Bell), . .	6	6	Not counted.		Not counted.	
2	Mr Halliday, ...	5	3	1	10	1	23
3	Messrs Kemp, Murray, and Nicholson,	5	3	1	30	1	20
4	Mr Douglas, ...	5	0	1	32	1	38
5	Mr Calder (Burgess & Key), . .	5	6	Not counted.		Not counted.	
6	Mr Baird, ...	5	2	1	10	1	30
7	Mr Gray (Gardner & Lindsay), .	5	2	1	13	1	15
8	Mr Henderson (Burgess & Key), .	5	6	1	3	1	3
9	Mr Hunter (Crosskill's Bell), .	6	6	1	10	...	...
10	Messrs Gillespie, ...	5	0	1	25	1	20

As a result of this, the *first* prize was awarded to No. 7 (Gardner and Lindsay), and the *second* between Nos. 3 and 6—viz., Messrs Kemp, Murray, and Nicholson, and Mr Baird—the Judges observing that, of the self-delivery reapers, Crosskill's Bell did its work most satisfactorily.

(*f.*) At the north Northumberland trial, Cuthbert won the *first* prize, and Gardner and Lindsay the *second*.

(*g.*) At the International trial of reapers near Goes, in the Netherlands, the following were the awards:—

First prize of 500 florins to Burgess and Key's machine.
Second ... Gold Medal to Cuthbert's ...
Third ... Silver Medal to Wood's ...

(*h.*) In addition to the foregoing, it may be interesting to give the following table from the 'North British Agriculturist,' showing the quantity of grain cut by machines in East-Lothian *alone* during 1860:—

Makers of Machines.	Number of Machines.	Acres Cut.				
		Wheat.	Barley.	Oats.	Beans.	Total.
Gardner and Lindsay,	119	2791½	1586	1668½	105	6151
Bell,	16	237	178½	267½	—	683½
Burgess and Key,	11	174	67	104	—	345
Halliday,	7	128	59½	107	—	294½
Hussey,	2	25	17	10	—	52
Dray,	2	118	—	14	—	132
Wood,	1	38	30½	—	—	68½
Goodlet,	1	16	—	6	—	22
Wight,	1	—	—	8	—	8
Various (Longniddry trials),	—	4	2	15	12½	33½
	160	3531½	1940½	2200	117½	7789¾

(*a.*) 1861.—At the trial at Leeds, the Royal Agricultural Society acted wisely in dividing the machines into various classes, according to their special adaptation. In the class for *self-delivery* machines, were found those of Lord Kinnaird, Messrs Prentice, Cranston, Hillard, Crosskill, and Burgess and Key. Of the combined machines (grass-mowers and reapers), Cranston and Burgess and Key were the only exhibitors; whilst of those with *manual delivery* might be noticed, the machines of Beckwith, Cranston, Burgess and Key, Cuthbert, Sawney, Brigham and Bickerton, Coates, Picksley and Sims, and Spencer. The trial was adjourned from the time of show till harvest, when after a severe competition at Garforth, the Judges made the following awards:—

Self-delivering machines,	1.	£14 to Crosskill's Bell.
	2.	£ 6 to Burgess and Key.
Manual-delivery machines,	1.	£ 6 to Picksley and Sims.
	2.	£ 4 to Cuthbert.
Combined machines,		No award.

The most remarkable feature during this trial, was the improvement noticed in Crosskill's *Bell*, it being now made for *three* horses, with a width of 8 feet 3 inches, and, at the same time, 5 cwt. lighter in weight, thus reducing the draught, and also lowering the price to £37. In this case, however, the land and crop were specially favourable to the propelling machine, the former being level, with few water-furrows, and the latter strong and stiff. The following is a table of results obtained in the trial of reaping machines at Garforth, near Leeds, August 23, 1861:—

Exhibitor's Name.	No. of Stand.	No. of Article.	Width of cut.	Length of cut.	Quantity cut in Square Feet.	Time in cutting.	Draught in lbs.	Speed of Horses.		Units of power expended to do the work.	Units of power to cut *one* square foot.	Quantity the Machine would cut in acres per hour.	Horse power.
								Feet per minute.	Miles per hour.				
SELF-DELIVERY.			ft. in.	feet.		m. s.							
Burgess and Key,	44	491	5 8	702	3977.95	3 0	442.25	234.	2.602	310459.5	78.	1.8284	3.138
Crosskill's Bell,	41	492	8 3	702	5791.5	3 0	416.17	234.	2.602	292157.	50.44	2.659	2.95
MANUAL-DELIVERY.													
Picksley and Sims,	108	1254	5 3	702	3685.5	2 35	206.	271.77	3.088	144612.	39.2	1.965	1.696
Cuthbert,	35	321	4 5	702	3100.	2 50	264.83	248.05	2.813	185910.	59.97	1.509	1.99

(*b*.) One of the most important trials of the year took place at Yester, under the auspices of the United East-Lothian Agricultural Society, when the following was the decision of the Judges :—

Back-delivery Two-horse Machine.

1. £10, Mr Thomas Halliday, Haddington.
2. £ 7, Gardner and Lindsay.
3. £ 5, Kemp, Murray, and Nicholson.

Back-delivery One-horse Machine.

1. £10, Bamlet, Yorkshire.
2. £ 5, Cuthbert, Bedale.

The appended table taken from the 'Scottish Farmer,' shows the time occupied by each machine :—

Names of Exhibitors and Makers.	Time the Machines took to cut ½ acre of Oats.		½ acre of barley.	
	Hours.	Min.	Hours.	Min.
J. Drummond,	Broke down.		Broke down.	
J. Pringle (Samuelson's two-horse),	0	58	0	51
J. Pringle (Samuelson's one-horse),	1	0	1	16
Gardner and Lindsay,	0	57	0	39
W. Gray (Gardner and Lindsay,)	0	47	0	39
Kemp, Murray, and Nicholson,	0	45	0	43
Brigham and Bickerton,	0	57	Not counted.	
R. Baird,	1	7	0	40
W. Reid Clune (Jack and Son),	0	50	Retired.	
Shott's Iron Company,	1	0	0	0
T. Cowie,	Broke down.		0	0
Mears (Cuthbert's one-horse),	0	45	0	52
J. Dudgeon (Cuthbert's two-horse)	1	2	1	10
P. H. Hume (Bell's),	1	15	Retired.	
J. Muirhead,	0	40	0	38
James Begbie (Bamlett's one-horse),	0	37	0	40
Thomas Halliday,	0	49	0	33
J. M. Russell (Kemp, Murray, and Nicholson),	1	0	Knife broke.	

(*c*.) At Shiels, near Ayr, considerable interest was excited by a trial in which no less than thirty-three machines were entered for competition, the result of which was, that the *first* prize was awarded to Jack and Son of Maybole, and the *second* to Wallace of Fenwick—both improved Husseys.

(*d*.) At the Dunfermline competition, the *first* prize was won by Kemp, Murray, and Nicholson.

(*e*.) At the north Northumberland trial, Burgess and Key were placed *first*, with their combined machine, and Trotter *second.*

(*a*.) 1862.—An interesting competition took place this year at Monkton Hill, Ayrshire, where twenty-nine machines were entered, and twenty actually started, with the following results :—

1st prize to Wallace's machine.
2d ... to Jack & Son's do.
3d ... to Brown & Young's do.
4th prize to Jack & Son's machine.
5th ... to Wallace's do.

(*b*.) At a private (not competitive) trial held at Wester Cowden,

originated by Mr Wilson, for the purpose of ascertaining the comparative draught of several machines by means of the dynamometer, the following results were obtained :—

No.	Name.	Width of Knife.		Empty *out* of gear.	Empty *in* gear.	Cutting wheat.	Actual width cut.	
		ft.	in.	cwt.	cwt.	cwt.	ft.	in.
1	Wallace, ...	5	3	$1\frac{1}{4}$	$1\frac{1}{2}$	$2\frac{1}{2}$ to $2\frac{3}{4}$	4	10
2	Kemp, Murray & Nicholson, . . .	5	3	$1\frac{1}{2}$	2	$2\frac{3}{4}$ to 3	4	10
3	Wallace (*driven* by an archimedian screw),	5	3	1	$1\frac{1}{2}$ to 2	$2\frac{1}{2}$	4	10
4	Bell, ...	6	6	2 to $2\frac{1}{2}$	3	4 to $4\frac{1}{2}$	6	0
5	Brigham & Bickerton (Buckeye), . .	4	8	1 to $1\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{1}{4}$ to $2\frac{1}{2}$	4	4
6	Bell, ...	6	6	2	3	$4\frac{1}{2}$	6	6

(*c.*) At the Union Agricultural Society's trial at Dumfries, the machines were classified into (1) reaping machines, (2) combined reapers and mowers, and (3) mowing machines, when, after two days' trial, the results were as follows :—

1. *Reaping Machines.*

Best *two*-horse reaper, Messrs Jack & Son.
Best *one*-horse reaper, Mr M'Cutcheon (Bamlett's Patent.)

2. *Combined Machines.*

Best two-horse machine, Mr Bamlett.
Best one-horse machine, Messrs Brigham & Bickerton.

3. *Mowing Machines.*

Best two-horse mower, Messrs Brigham & Bickerton.
Best *one*-horse mower, Mr M'Cutcheon (Wood's).

(*d.*) At the North Lancashire trial of reapers held at Preston, out of 18 machines entered for competition, 7 were actually tested, including *two* with self-acting sheaf-delivery—viz., M'Cormick's and Samuelson's, and *five* with ordinary manual delivery apparatus —viz., Cranston's (Wood's), Gardner & Lindsay, Brown & Young, Dray, and Picksley & Sims. The *first prize* of a silver medal and £15 was *unhesitatingly* awarded to M'Cormick's Automaton Reaper, and the *second* to one of the Scotch manual-delivery reapers. (*e.*) A similar honour was also conferred on M'Cormick, the result of a trial at Norwich, about the same period.

With regard to the question of comparison of the expense of reaping grain by the various systems of *sickle, scythe*, and *machine*, the writer is able to speak very confidently in favour of the *latter*, after *five* years' experience, during which period he has cut with *one* machine upwards of 1200 acres of different kinds of crops, *exclusive* of a large quantity cut for his neighbours. Previous to the use of a reaping machine, the cutting of *wheat* on *this* farm cost as follows :—

(Formerly) By hand-labour.

The reaping, binding, and stooking of wheat from 11s. to 15s. per acre.
Mowing, binding, and stooking of wheat, about 8s.

(Now) By machine.

Cutting of wheat,	1s. 6d.	5s. 9d. per acre, exclusive of wear and tear, interest on capital, &c., &c.
Binding and stooking,	4s. 3d.	

The above has reference more particularly to the harvesting of wheat; hence all other crops cut by hand will be in due proportion. But whilst the cost of cutting oats by *sickle or scythe* will be proportionably and considerably *less* than wheat, no difference can be made in the cost of cutting these crops by a machine, inasmuch as the same staff is required for the cutting, though, in some cases, oats may be more expeditiously taken up and stooked than wheat or barley. On *this* farm the corn, which is cut by a *swathe-delivery* machine, is taken up by women using long-toothed rakes, each of these requiring a boy *preceding* them to make bands, and a man following to bind and stook, which gang can take up, on an average, 1½ acre per day, at a cost of 4s. 3d. per acre. It will be evident, however, to every one conversant with the variable kinds of crops with which the reaping machine has to cope, that there must be a necessary and considerable differenee in the cost of cutting as well as of taking up the corn—as, for instance, where circumstances admit of a heavy crop being cut in *one* direction *only*, one half of the time of both men and horses is wasted by having to return *empty*. Taking, however, the cost of cutting, binding, and stooking *all* our grain crops—one with another—at 11s. per acre by manual labour, we find a saving *at once* of from 30 to 40 per cent by the use of a reaping machine; and this opinion seems to be indorsed by the experience of our leading agricultural authorities on this subject — such as Messrs Wilson of Edington Mains, Hunter of Thurston, Hope of Fenton Barns, Wilson of Wester Cowden, and others, who have kindly come forward and recorded, for the public benefit, in addition to their valuable opinions, the expenses of their harvest operations. The experience, however, of the writer with regard to the saving accruing from the use of reaping machines would lead him further to observe—

(*a*.) That a swathe-delivery reaper takes the place and does the work of *ten* good mowers on average corn.

(*b*.) That a manual sheaf-delivery reaper, does the work of from *sixteen* to *twenty* reapers with *sickles*.

(*c*.) That a sheaf-delivery reaper with automaton rake does the work of *thirty* reapers with sickles.

As to the much-vexed question of the delivery of the corn—whether in the form of a swathe or sheaf—the writer does not propose offering an opinion, preferring to leave it an open question, to be settled by each individual farmer according to the circumstances under which he is placed as to climate, extent of farm, size and form of fields, available labour, and suchlike; inasmuch as in a climate of so variable a nature as that of Britain, no *universal* system could possibly be recommended with advantage.

But apart from the actual pecuniary saving to the farmer by the use of a reaping machine, in reducing the expense in the har-

vesting of his crops, whilst his labourers are at the same time receiving fair wages, there are other advantages which must not be overlooked. Not the least of these is in the performing of the work at a proper time and in a superior manner, with the ordinary staff of labourers employed on the farm;—in the saving of corn from shaking;—in an increase of the quantity of straw by low cutting;—expedition in the general routine of harvest operations;—the more rapid process of drying, and consequently acquiring the necessary condition for stacking in a much shorter space of time than by the old system, thus lessening the risk of injury from unfavourable atmospheric influences.

But whilst the farmer is thus no longer subjected to the supercilious and intolerant behaviour of bands of unscrupulous reapers, he ought not to consider the reaping machine as an absolute substitute *for*, but rather as an efficient aid and addition *to*, his ordinary available staff, at a season of the year when manual labour is *most* expensive and horse power *cheapest;* for instances will ever exist—either from excessively small farms, which cannot afford a machine, or from laid and twisted crops—where the sickle or scythe must be called into requisition. Too much, therefore, *ought* not to be expected from the reaping-machine; and where it *is* employed, care should be taken that the previous preparation and treatment of the land be such as will *allow* it to work to the greatest advantage. Such preparation should consist in the thorough drainage of the land and subsequent levelling of the surface, in the abolition of water-cuts and furrows, as well as of large stones, and in properly finishing the process of cultivation by rolling, &c. By a careful observance of these few points, the chief obstacles to reaping by machinery will thus be removed.

ON THE CULTIVATION OF THE CARROT.

By JOHN STEVENSON, Garrallan, Cumnock.

[Premium—The Medium Gold Medal.]

THE carrot, as a field crop, occupies the same place in the rotation as the potato and turnip, but is sown to a much more limited extent. Its culture, as a field crop, requires a greater amount of carefulness in the preparation of the soil, and it is only on certain kinds of soil where a remunerative crop can be obtained.

The most suitable kind of soil for the carrot is a deep sandy loam: it will not succeed on a clay or gravelly soil, especially if the former has a stiff retentive subsoil. If the soil is not

naturally deep, it requires to be made artificially so by means of deep-ploughing and subsoiling. The carrot succeeds very well as a field crop on newly-reclaimed moss, from its long fusiform root, which grows entirely under the ground; it requires the soil to be loosened, by the plough or otherwise, to the depth of from 12 to 14 inches.

The carrot is generally cultivated in the field after a crop of oats, although I have raised a crop of 26 tons per acre on old lea, having paired off the sward about 3 inches thick, laying it flat in the bottom of the trench, and turning the land over it to the depth of 16 inches, in the month of November, previous to cropping, allowing the spadefuls to rest on the one end on turning it over, so that the frosts in winter might better penetrate the ground. In the month of April the land was in fine condition, requiring once grubbing only to put it in order for drilling. The land was of a rich deep earthy loam, with open subsoil. The trenching of the above-mentioned land cost £5, 18s. per acre.

On light sandy loam the best system of cultivating the carrot in the field is to apply the manure on the stubble in the beginning of November, and plough it in, applying artificial manures at time of sowing; but on heavy soils it has been found to be more profitable to plough the land in the beginning of November to the depth of 10 inches, and apply the manures wholly at seed-time. When the dung is applied in November and ploughed in, the land retains the wetness much longer in spring, and is more difficult to get into a fit state for the proper reception of the seed, especially if the climate is cold. I have mentioned a few items of practice which have to do with the extensive cultivation of so valuable a crop as the carrot.

On light sandy soils in some districts the carrot is grown in the field without forming the land into drills, when the manure has been ploughed in during winter, by making ruts 6 inches deep and 26 inches apart; applying artificial manures at time of sowing. But great care has to be taken by this system not to allow the artificial manures to come into direct contact with the seed. To prevent that, a light harrow should be passed over the land after the manures have been sown, and before depositing the seed into the ruts. After the harrow has gone over the land the seed may be sown by the hand into the ruts, passing the light harrow over the land again—rolling afterwards; but the more common and better practice of cultivating the carrot in the field is to form the land into drills, as will be afterwards described.

The best kind of manures for the carrot is horse-dung, at least one year old before using it to the crop, as will be seen from the following experiment:—The land having lain in the fallow state all winter, and until the beginning of April, when the cultivation

of the land may be said to begin. Ploughing and subsoiling to the depth of 15 inches, grubbing and harrowing well and gathering all weeds and stones carefully off. Attention to the cleaning of the land before putting it into drills saves a great amount of expense and labour during the summer. After this process has been neatly gone through, the roller should be passed over the land before drilling it, so as to smooth the surface.

The land should now be in a good state for forming into drills, which should be done by the double mold, the drills formed 26 inches apart and 16 inches deep from top of drill to bottom; as it is of great advantage to the successful growth of the carrot in the field to have the drills formed deep. If the land is not thoroughly dry when drilled, it should be allowed to dry a day or more, so that the carting of the dung may not damage the land.

The quantity of dung applied to the acre may be from 30 to 40 cartloads, of about 10 cwt. each, according to the state of the soil, besides artificial manures, as the carrot cannot be too richly manured. Having been in the habit of applying 35 cartloads of dung and about 500 gallons of tank-urine, 4 cwt. of Peruvian guano, and about 6 cwt. of common salt per acre, in the following manner:—15 gallons of urine are poured on each cart after the dung has been filled into it. This causes it to be in a soft and saturated state. When spreading in the drills great care must be taken not to allow the least lump of dung to remain unbroken, for when the carrot root comes in contact with it, it causes the carrot to split or fork at the bottom, and renders them not so valuable for many purposes.

After the dung has all been neatly gone over as above described, and before applying the artificial manures, the drills should receive one turn with the common harrow, so as to bring the artificial manures in closer contact with the seed; as the drills being formed at such a depth the carrot requires the aid of the guano to support it until the root reaches the dung. As soon as the guano and salt is applied (the latter is a great means of destroying worms), the drills should be split immediately with the double-mold-plough, and as deep as when drilled.

From the 20th April to the end of the month is the best time for sowing the carrot; if sown sooner it often suffers from frost, and also has a tendency to cause them to run to seed. About eight days before intending to sow, the carrot seed should be mixed with as much sand as will cause it to sprout—keeping it always in a damp state, and whenever it is observed to be chipping, sowing must be proceeded with immediately.

The quantity sown per acre is from 8 to 10 lb., and in some cases more, just according to the quality of the seed. The carrot seed is often of inferior quality; when known to be so, I

sow about ½ lb. mangold-wurzel and ½ lb. white turnip-seed per acre along with the carrot, and have found this to be of great advantage.

The carrot is often of an irregular braird when the season is dry and the land not reduced to a fine mould. The mangold forms an excellent substitute, and the white turnip brairds readily. The insects, which are not few, take to the turnip, which often saves the carrot from their ravages. As I have not seen to my mind a properly constructed machine for sowing the carrot seed, I pass the turnip sowing-machine along the drills with the coulters down: this forms a rut about 2 inches deep and 2½ broad in the bottom, depositing the seed by the hand into the rut; and, to insure regularity of sowing, the drills must be counted, and the seed intended to sow each drill measured, so that a whole acre may be sown exactly alike in thickness. Three men will sow about 2½ acres per day. After this the sides of the ruts should be raked in by light iron rakes—a roller of a concave form should then be passed over the drills, leaving the surface quite smooth.

The varieties of carrot sown in the field are generally the common red Altringham, the superb long red Altringham, and the white Belgian. The common red Altringham is rather a coarse variety, of an irregular shape, and not of a bright red colour. From 11 to 14 tons per acre is considered a full crop.

The superb long red Altringham is a first-class saleable carrot. It is of a fine rich deep red colour, long and very clean, with a comparatively small heart and shaw at crown. It grows a little above the ground. A crop of from 15 to 20 tons per acre may be considered a large crop.

The white Belgian is a very good carrot for feeding horses. It does not grow long; thick at crown; tapering quickly at bottom; and grows wholly under the ground. Of course, larger crops have been raised, with all the different varieties, than I have stated; but from 12 to 16 tons per acre is considered a good crop of the white Belgian variety.

All the above varieties of the carrot are natives of Belgium; are grown there in the field; sown broadcast; singled out by the hand This in Scotland would be considered a slovenly system of cultivating them as a field crop. The carrot is well suited for the climate of Scotland; and can be profitably raised on suitable soils.

The carrot seed used in Scotland is mostly of English growth; but there are large quantities imported from Holland. Any farmer can easily raise it, if situated in a dry climate, and selecting carefully the finest roots; inserting them into a convenient piece of ground in the end of October—some prefer the beginning of March; planting them out in rows at 28 inches apart, covering

the crowns with about 2 inches of earth; grubbing and cleaning them well during the summer. The seed will be ripe in the autumn. In gathering the seed, great care ought to be taken to select the ripest and best-looking plants. The yield may be expected to vary from 2 to 5 lb. per square fall.

In about 20 days after sowing the carrot-seed, the plants will be putting forth small leaves about 1½ inches high, and getting the peculiar carrot shaw. Through the month of June grubbing, scuffling by the hand-hoe, weeding, and singling should take place; singling them out to the distance, at first, of 2½ inches apart in a zigzag form, leaving, where any vacancies occur in the braird, a healthy plant of the mangold. If white turnips are sown amongst the carrot, they should all be pulled at first weeding. After they have all been gone over in the manner as above described, the weeds must all be gathered from between the rows and carried off. The expense of the first weeding and singling will be from 10s. to 15s. per acre, according to the state of the land. The space between the drills will now be very much beaten down by the trampling amongst them when weeding, &c.; the grubber should be passed through them to the depth of 8 inches, and if the season is wet, or the land of a wet description, the double mould should follow, pressing the loose earth up into the roots of the carrot, as near as possible, taking care not to crush and injure them. When the carrot is at this stage, some prefer applying top-dressing. This, as far as my experience has gone, never paid so well as when applied farther on in the season, when the carrot is making the greatest progress in growing, from July to September.

They should now be allowed to remain in that state until the end of July, when grubbing, scuffling with the hand-hoes, weeding and singling to the proper distance, should be proceeded with, taking out every alternate carrot, keeping it always in view to give a preference to the healthiest-looking plant, thus making the distance at 5 inches apart. This is considered a better system than singling out to the proper distance at first weeding, because it has a tendency, when pulling out every alternate carrot, to loosen the soil around the remaining plants, and allowing them to spread out more freely to a much larger size than when the soil is all solid around them; and I also find, in an ordinary good crop of carrots, the thinnings are worth about the expense of the weeding and singling this time for stock, which will cost from 10s. to 12s. per acre; and at this the last singling and weeding, if any of the carrot roots have appeared where the vacancies were at first thinnings, the mangolds should be removed, as in all kinds of green crop one variety, grown together, is the most profitable crop if it can be obtained, and it has the best appearance.

When top-dressing is to be applied, it should be done now by

the hand, spreading it carefully into the crowns of the carrots, right on the top of drills. Grubbing after between the drills, then followed by the double mould, pressing the earth up into the crown of carrot as near so as not to injure the shaws. As to the kind of top-dressing applied, guano has been found to be the best, applying from 2 to 4 cwt. per acre. Care must always be taken to apply the guano, when top-dressing the carrot, when rain is about to fall, if that can possibly be done. In the following experiments I applied, on the 26th July, a top-dressing of Peruvian guano, at the rate of 2 cwt per acre.

The cultivating of this crop may be said to be now nearly finished. From the beginning to the end of October is the proper time for raising the crop, as by getting the least frost it is injured, and liable to decay during winter. But if properly taken up and stored, they can be kept quite fresh until the month of June.

In raising the crop the drills should be loosened by means of a grape, at least 10 inches long, with the prongs quite straight. It should be introduced perpendicularly, and at least 6 inches from the crown of the carrot, and pressing it up gently, so as not to injure the root. In pulling out the root by the hand, care must be taken to pull them upright, as the least twist causes them to break, and renders them not so valuable. In cutting off the shaws, care must be taken not to injure the crown, keeping at least one inch free of it. In storing, the best and simplest method is to place them in pits of 3 feet broad at bottom, 2½ feet high, tapering in at the top to the length of one carrot. In placing the carrots in the pits, they should be laid out-and-in neatly to the broad side of the pit, putting about 1 inch of fine sand into every 6 inches deep of carrots in the pit. The cost of raising and storing will be from 25s. to 30s. per acre.

Having described, very briefly, the whole process of the cultivation of the carrot as a field crop, I shall now give, in the following experiment, a detailed account of the manures and seed applied, with the cost of each; the crop obtained, with and without artificial manures, and the price sold at,—all at the rate per imperial acre. The crop was sold growing by the drill, on 2d October 1861.

The soil on which the following experiment was conducted is of a strong earthy loam of equal quality; stiff but not retentive subsoil; has a northern exposure; is situated at an altitude of 650 feet. The soil I did not consider very suitable for the carrot; it was tile-drained, at 3½ feet deep, and 20 feet apart; and was cropped with oats the previous year.

Table I.

Cost of Manures and Seed for One Acre of Carrots, divided into Four Lots, as under:

Description of Manures.	Manures. Cost per Lot.	Manures. Total Cost per Lot.	Seeds. Cost per Lot.	Seeds. Total Cost per Lot.	Top-Dressing. Cost per Lot.	Top-Dressing. Rate per Acre.
	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
1st Lot.—18 drills manured at the rate of 35 cartloads per acre, of *horse-dung one year old, and saturated with tank urine at the rate of 500 gallons* per acre, at 2s. 6d. per load, . . .	1 1 10½					
Peruvian guano, rate 4 cwt. per acre, at 13s., . . .	0 13 0					
Common salt, rate 6 cwt., at 1s., ...	0 1 6	1 16 4½				
2½ lb. superb long red Altringham carrot-seed, at 5s. per lb., .	.. ..	.. ..	0 12 6	0 12 6		
Top-dressed 9 drills on 26th July at the rate of 2 cwt. Peruvian guano, per acre, cost, .	.. ..	.. ..	.. ..	.. ..	0 3 3	
2d Lot.—18 drills manured at same rate as lot 1 with *common farmyard dung made the previous winter*, 2s. 6d., . .	1 1 10½					
Peruvian guano at same rate as above, ...	0 13 0					
Common salt, do. do., . .	0 1 6	1 16 4½				
2½ lb. common red Altringham carrot-seed at 2s. per lb. cost, ...	.. ..	.. ..	0 5 0	0 5 0		
Top-dressed 9 drills same rate as lot 1, ...	.. ..	.. ..	.. ..	.. ..	0 3 3	
3d Lot.—18 drills manured *with town ashes at same rate and value as previous lots*, at 2s. 6d., .	1 1 10½					
Guano and salt, same rate as above, ...	0 14 6	1 16 4½				
2½ lb. superb red Altringham at 5s., ...	.. ..	.. ..	0 12 6	0 12 6		
9 drills top-dressed as above in July, ...	.. ..	.. ..	.. ..	.. ..	0 3 3	
4th Lot.—14 drills manured *with cow-dung alone at same rate and value as previous lots*, including guano and salt, ...	1 8 0					
4 drills manured with guano alone at same value as previous lots, including dung, guano, and salt, applied at seed-time,	0 8 4½	1 16 4½				
1½ lb. common Altringham, at 2s., ...	.. ..	.. ..	0 3 0			
1 lb. white Belgian, at 1s. 6d.,	.. ..	.. ..	0 1 6			
½ lb. mangold wurzel per acre, at 1s. 2d., ...	.. ..	.. ..	0 0 7			
½ lb. white turnip per acre, at 10d., ...	.. ..	..	0 0 5	0 5 6		
The 4 drills manured with guano alone were sown with common red.						
Total cost per acre for manures at seed-time, ...	.. ..	7 5 6				
Total cost per acre for seed, .	.. ..	1 15 6	.. ..	1 15 6		
Total cost of top-dressing applied,	.. ..	0 9 9	.. ..	.. ..	0 9 9	
Rate per acre for top-dressing, .	.. ..	.. ..	.. ..	.. ..	.. ..	1 6 0
Total expense of the whole acre,	.. ..	9 10 9				

TABLE II.

Weight of Crop, and Price realised. Carrots Sown on 19th April, and Raised middle of October 1861.

	Weight per Drill.	Weight per Half Lot.	Actual Weight of each Lot.	Extra Weight by Top-dressing	Weight per Acre on each Lot.	Rate Sold per Drill.	Rate per Half Lot Sold at	Total Rate per Lot.	Profit by Top-dressing, per Lot.	Profit on Top-dressing per Acre, each Lot.
	cwt. lb.	cwt. lb.	Ton. cwt. lb.	cwt. lb.	Ton. cwt. lb.	s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
1st Lot—9 Drills, without top-dressing, gave	5 56	49 56	..	..	19 16 0	11 6	5 3 6			
9 Drills, with top-dressing, gave	6 26	56 10	5 5 66	6 66	22 8 80	13 0	5 17 0	11 0 6	0 13 6	5 8 0
2d Lot—9 Drills, without top-dressing, gave	3 6	27 54	..	..	10 19 96	9 2	4 2 6			
9 Drills, with top-dressing, gave	3 56	31 56	2 18 110	4 2	12 12 0	10 6	4 14 6	8 17 0	0 12 0	4 16 0
3d Lot—9 Drills, without top-dressing, gave	2 0	18 0	..	..	7 4 0	8 0	3 12 0			
9 Drills, with top-dressing, gave	2 56	22 56	2 0 56	4 56	9 0 0	9 0	4 1 0	7 13 0	0 9 0	3 12 0
4th Lot—8 Drills, cow-dung alone, gave	2 10	21 0	..	..	9 9 0	8 6	3 3 0			
6 Drills, cow-dung alone, and sown with white Belgian, gave	3 0	18 0	..	..	10 16 0	7 0	2 2 0			
4 Drills, guano alone, gave	1 20	4 80	2 3 80	..	4 4 96	4 0	0 16 0	6 6 0		
Actual weight of this acre,	..	..	12 8 88							
Extra weight by top-dressing,	..	..	..	15 12	..	..	..	..	1 14 6	
Deduct cost of top-dressing, three Lots,	..	..	..	..	..	..	..	..	0 9 9	
Profit on three Lots by top-dressing,	..	..	..	..	..	..	..	..	1 4 9	
Or at the rate per acre, of	..	..	..	..	..	..	..	..		3 6 0
Total sum realised for this acre,	..	..	..	..	..	..	..	33 16 6		
Expense of manure and seed,	..	..	..	..	..	..	9 10 9			
Weeding and singling,	..	..	..	..	..	..	1 4 6	10 15 3		
Net profit, exclusive of horse-meat,	..	..	..	..	..	..	..	23 1 3		

GENERAL REMARKS.

As will be seen from the above Tables, Lot 1st, manured with horse-dung one year old, well saturated with tank urine, Peruvian guano, and salt, all applied at seed-time, produced the largest crops, where top-dressing with guano had not been done. But in all the cases where the carrot was top-dressed, as in this experiment, and in many others by myself, the extra return was found to be remunerating.

That, in my opinion and many other practical farmers, the manures applied, as in Lot 1st, is the best kind for the carrot, and also that the superb long red Alteringham is the most profitable kind to cultivate in the field, both as regards quantity and quality.

Lot 2d, manured with common farmyard manure made the previous winter, with the addition of guano and salt, has not been found so suitable for the carrot, principally on account of the newness of the dung; the carrots on this Lot not having turned out so well when raised, as they appeared to do when growing. This I allude to partly from the inferior kind of carrot, as well as the manure. It cost the purchaser a higher price, by the ton, than the previous Lot.

Lot 3d, manured with town's ashes, guano, and salt at seed-time, did not produce a large crop. Ashes have never been considered a good kind of manure for the carrot; but my object in this experiment was to give them a fair trial, along with farmyard and other manures.

Lot 4th, manured with cow-dung alone, shows a deficiency, and proves that guano, or other kinds of artificial manures containing similar ingredients, is necessary to the successful growth of the carrot as a field crop. The small Lot which was manured with guano alone, shows that this is not a suitable manure for the carrot by itself.

As shown in the first Table, all the different manures were applied in equal value to each Lot. Each Lot brairded pretty equally, with the exception of the small Lot manured with guano alone, which was about eight days later, and it showed a deficiency all through the summer.

The Lots top-dressed with guano in July showed a decided improvement in the course of fourteen days after being applied, and continued to do so all the season.

The white Belgian carrot gave a fair crop in weight, but was not in demand, and consequently did not bring so high a price to the acre.

REPORT OF PROCEEDINGS IN THE EDINBURGH VETERINARY COLLEGE.

By Professor Dick.

Summary of Cases, comprising Diseases, Injuries, &c., amongst Domesticated Animals, which have been under treatment during the months of July, August, and September 1863, as registered in the Clinical Transactions of the Edinburgh Veterinary College.

	Horses.	Cattle.	Dogs, &c.
Abscesses in various parts,	9	...	1
Apthæ epizootica (murrain),	...	8	...
Angleberries, removal of,	2	...	...
Ascites,	...	...	1
Bones, diseases and injuries of,	2	...	...
,, fractures of,	5	...	...
Broken knees,	8	...	...
Bursæ, distension of, with lameness,	1	...	...
Castration,	2	...	1
Catarrh and sore throat,	32	...	6
Chorea,	2	...	1
Colic,	28	...	...
Constipation (obstinate),	1	...	1
Cracked heels,	2	...	...
Curbs, with lameness,	5	...	...
Debility,	2	...	...
Diabetes,	2	...	...
Distemper,	...	...	11
Docking,	1	...	..
Epilepsy,	...	...	1
Examinations as to soundness,	54	...	...
Eyes, diseases, &c., of,	3	...	3
Fistula,	1	...	...
Farcy,	3	...	...
Fardel-bound,	...	1	...
Feet, canker in,	1	...	...
,, corns in, with lameness,	2	...	...
,, inflammation in,	2	...	...
,, navicular disease in,	23	...	...
,, pricks in,	6	...	...
,, quittors in,	4	...	...
,, sandcracks in,	4	...	...
,, seedy toe in,	4	...	...
,, side-bones,	2	...	...
,, thrushes in,	3	...	...
,, wounds and bruises in,	15	...	...
Glanders,	1	...	...
Glandular swellings,	1	...	...
Grease,	3	...	...
Gastritis,	...	...	3
Head, injury of,	1	...	...
Hæmoptysis,	1	...	...
Heart, diseases of,	2	...	...
Indigestion, chronic and acute,	4	2	...

	Horses.	Cattle.	Dogs, &c.
Influenza,	6	...	...
Knee, swelling of,	1	...	...
Lameness, elbow,	1	...	...
„ fetlock,	4	...	...
„ hip,	11	...	...
„ hock,	9	...	...
„ knee,	3	...	...
„ pastern,	1	...	...
„ shoulder,	1	...	...
„ stifle,	6	...	...
Mallenders,	1	...	...
Mammitis,	1	...	...
Mange,	16	...	4
Nasal gleet,	1	...	...
Nettlerash,	3	...	...
Open joint,	1	...	...
Over-exertion,	1	..	...
Parotid gland, inflammation of,	1	..	...
Phlebitis (inflammation of vein),	1	...	...
Paralysis,	1	...	...
Pleurisy and bronchitis,	5	...	...
Pleura-pneumonia,	...	6	...
Rectum, obstruction of,	1	...	...
Ringworm,	...	...	1
Ringbones, with lameness,	6	...	...
Roaring, thick and broken wind,	6	...	...
Sore shins,	1	...	...
„ back,	2	...	...
Spavin, with lameness,	10	...	...
Spine, injury of,	1	...	...
Splints, with lameness,	17	...	...
Sprains, muscles,	2	...	...
„ tendons, ligaments, &c.,	18	...	...
Stomach, 1st, distension of (hoven),	...	2	...
„ „ inflammation of,	...	1	...
„ ulceration of,	1	...	...
„ staggers,	2	....	...
Strangles,	7	...	...
Stringhalt,	2	...	...
Surfeit (eczema),	4	...	...
Teeth, diseases and injuries of,	4	...	...
Tetanus,	1	...	...
Tumours, various,	3	...	2
Weed,	19	..	...
Venæ cavæ post: rupture of,	1	...	...
Worms, intestinal,	2	...	1
Wounds and bruises in other parts than feet,	29	...	1

General Abstract.

Cases amongst horses,	458
„ „ cattle, &c.,	20
„ „ dogs, &c.,	38
Total,	516

The cases registered during the quarter ending September 30th are, with few exceptions, those usually met with in the ordinary routine of practice. In the list of injuries, a number considerably exceeding the average is recorded of cases of broken knees. The great majority of these occurred in cab-horses, and can readily be accounted for as follows:—During the summer months the periodical influx of strangers visiting our city takes place; these commonly are most anxious to husband their time to the best advantage, and to see in as short a period as possible the varied romantic beauties, for the possession of which Edinburgh has been long and deservedly known. For this purpose a cab is engaged, and the poor horse, with a heavy load, not unfrequently amounting to as many as five grown-up people in addition to the driver, is driven about for a protracted period. The poor tired animal, when ascending the steep streets with which the city abounds, and in consequence of the slippery state of the causeway, occasioned in a great measure by the late wet season, slips and comes down upon its knees. The result of this is an abrasion or laceration of the skin, in many cases the cuts being so severe as to penetrate and lay open the joint. The treatment to be adopted in such cases depends in a great measure on the extent of the injury. In the first place, it is absolutely necessary to remove carefully any dirt which may be adhering to the part. This is best done by the application of a poultice. In simple abrasion or laceration, without penetration into the joint, all that is required is rest, with a dose of laxative or purgative medicine; the application of cold water or white lotion being the best local remedy. After the part has been properly cleaned, should synovia be found making its escape, then we conclude the wound has penetrated either into the joint or into the sheath of the large tendon which passes over the front of the knee; the injury then is of a more serious nature, and the treatment much more difficult. If the wound in the joint be small, with very little synovia escaping, the horse's head should be tied up, so as to prevent him walking about; but if very extensive, then I would have him placed in slings. In either case, cold-water cloths should be applied to the part. Should these not have the desired effect in stopping the flow of synovia, then recourse must be had to some styptic, of which I prefer new-slaked lime, flour (to which is added a sulphate of copper), or the tincture of myrrh and aloes. In some cases the actual cautery to the part will be found beneficial, at the same time giving the animal a dose of laxative medicine. Should febrile symptoms make their appearance, then I would advise the administration of saltpetre or other febrifuge.

Among the cases of diseases of the eye one is worthy of notice from its rarity. In the beginning of the quarter I was sent for in the country to castrate a colt. After finishing the operation, I was requested to look at one of the work-horses, which the owner said

had been suffering for some months with a peculiar growth on one of its eyes. On examination I found the case to be one of *Fungus Hœmatodes* or bleeding cancer, only a few cases of which have been recorded as occurring in the horse. The eye was more prominent than natural, and from the inner canthus or angle projected a peculiar soft, red, spongy-looking tumour, which bled on the slightest touch. This was firmly attached to, and sprang from, the haw or *membrana nictitans*. After making a careful examination, I told the owner that, owing to the malignant nature of the disease, no remedial means of relief would succeed without complete removal of the diseased tumour, even should it necessitate the entire loss of the eye. As the animal's general health did not appear to be affected, he said, he would prefer not resorting to such an extreme measure in the mean time, but wait till some more simple means were tried. But I tried to persuade him, but in vain, that the *dernier ressort*, without loss of time, held out the only hope of success. I then had the animal secured as completely as possible without casting, and had the whole of the tumour projecting beyond the orbit removed. This was without much difficulty accomplished with the fingers and a pair of forceps, the tumour being quite friable. The part bled very freely during the operation, but stopped on the application of caustic. After removing as much as possible, I directed the person in charge carefully to attend to the application of lunar caustic twice daily to the surface of the wound. Being at some distance from Edinburgh, I have not had another opportunity of seeing the case; but within the last few weeks I have had a letter from the owner, stating that in spite of the continued application of the caustic the tumour or fungus has continued to grow. Should I again be consulted, the only alternative left, and which I would strongly recommend, would be the *melius anceps quam nullum remedium*—viz., extirpation of the whole contents of the orbit. I need scarcely add that all such cases are most intractable, and are dependent upon and connected with a malignant constitutional diathesis.

The case of phlebitis occurred in a horse belonging to a cabman in town. The horse was brought to the college-yard with the whole of the upper part of the near side of the neck swollen, hard and tender, and a wound on the course of the jugular vein, from which issued a thin sanious fluid. On inquiry I found he had been bled a few days previously by a blacksmith. I at once removed the pin with which the edges of the wound had been brought together, and ordered the part to be well fomented with warm water. The following morning I found the swelling much reduced and softer; but from the wound there were springing up unhealthy granulations. These I touched with lunar caustic, and recommended the fomentations to be continued. After the second day the hot-water applications were discontinued, as the swellings had become less painful. The granulations were again touched with caustic; and after con-

tinuing this mode of treatment for about a week, the wound took on a healthy action, and speedily healed up, but with total obliteration of the vein. This is one of those accidents which frequently occurs under the most judicious treatment. In the majority of cases, however, it can be traced to some want of care. For instance, the use of a rusty or otherwise dirty phleme in bleeding is a common cause of phlebitis. This untoward result frequently also proceeds from carelessness in pinning up the wound, the neglect being in not bringing both edges of the incision in apposition, or in leaving an inverted hair within the lips of the wound. Another and not unfrequent cause is the itching produced on the commencement of the healing process, which induces the animal to rub his neck against the manger, the friction acting as an exciting cause by setting up irritation and subsequent inflammation. The animal being allowed to hang his head after the operation is another cause, the dependent position interrupting the return of blood. Putting the animal too soon to work often also produces inflammation of the part. Constitutional diathesis must not be omitted in the enumeration of causes to be set down as an important predisposing one. In bleeding a horse, simple as the operation may seem, there are nevertheless several precautions necessary to be observed—viz., a clean instrument, the wound to be carefully pinned up, the animal's head to be kept tied up for at least some hours afterwards, and the horse not to be put to work immediately, more especially to collar work. On the first appearance of inflammation the pin should be removed, the head tied up, and the parts fomented with warm water, and a dose of purgative medicine administered. There is another form of accident occasioned by careless bleeding—viz., what is termed a *Thrombus*. This differs from phlebitis, inasmuch as in the latter case there is more or less violent and extensive inflammation of the coats of the vein; whereas in thrombus there is only simple effusion of blood or serum into the cellular tissue below the skin, the removal of which sometimes requires no inconsiderable attention. In both cases great local swelling supervenes, which, in the former, is hard, tense, and painful on pressure, and which generally proceeds upwards along the course of the vein, the vein feeling hard and wiry; whereas in thrombus the tumour is softer, less tender, and more diffused. In thrombus the application of hot fomentations, if speedily and persistently resorted to, embraces all the treatment required, and under it the swelling rapidly disappears.

The case of rupture of the posterior *venæ cavæ* occurred in a well-bred young horse belonging to a horse-dealer in Edinburgh. On the morning of the 1st September, I was sent for in great haste to see a horse which had received a kick from another horse, both having got loose in the stable. On my arrival at the stables, I found, on examination, that there was a slight abrasion of the skin on the buttock, but no other external mark of injury. The animal,

notwithstanding such an apparent slight injury, was evidently fast sinking. The pulse was quick, feeble, and irregular or fluttering. The body was covered with a profuse perspiration. The poor animal was sighing heavily, and scarcely able to stand, as indicated by the continual restless shifting of his feet. The visible mucous membranes were pale and blanched. These symptoms led me to diagnose the case to be one of rupture of some large blood-vessel, the animal becoming exhausted evidently from the loss of the vital fluid. To prevent fainting, I at once ordered stimulants to be administered; but at the same time, I warned the proprietor of the hopeless nature of the case, and that my prognosis was most unfavourable. In spite of the stimulants the animal got rapidly weaker, the pulse becoming more and more feeble, and the prostration more marked, until he dropped down and died without a struggle, about an hour and a half from the time he was first observed to have been injured. On inquiry, I found that the horse had never been noticed as ailing, having been able to do what work was required of him, but that he was of a highly nervous temperament, and easily frightened. After death, I requested that the carcass might be sent round to the college-yard, so that I might have a careful *post-mortem* examination made. On removing the skin, the whole of the muscles appeared pallid and bloodless. The abdominal cavity when opened was found almost full of partially coagulated blood. After this blood was removed, the intestines and other abdominal viscera were carefully and separately examined and taken out, so as to expose the large trunk vessels. On reaching the posterior *venæ cavæ*, the large vessel which conveys the venous blood from the posterior parts of the body to the heart, and which is situated along the roof of the cavity, a rupture of about half of an inch in extent was discovered, immediately in front of the right kidney. Although satisfied that this was sufficient to cause death, I desired the examination to be continued, which was done, but no further injury could be discovered, with the solitary exception of the bruise on the buttock before-mentioned. The thoracic cavity, as well as its contained viscera, the heart and lungs, were perfectly healthy, only that the heart was quite empty, and its walls, as well as the structure of the lungs, resembled the muscles in being pale and bloodless. The vein at the place of rupture presented no appearance of having been dilated, nor did its coats present any thinning or alteration in structure. The stomach was full and quite healthy. The liver, spleen, and kidneys also appeared in perfect health. The question now remaining to be solved, is the cause of this fatal lesion. And the only way I can account for it is, that the horse, in his sudden fright from the kick, must have made a sudden bound forwards, bringing into rapid and violent contraction the muscles lying between the vessel and the back-bone, thus impeding the flow of blood, and, as a matter of

course, suddenly arresting the circulation; and the coats of the vein being thin, from congenital organisation, for no morbid condition could be traced on any part or structure, had given way under the violent and sudden shock. These cases are extremely rare. I never witnessed a similar one before, in the whole course of my long and extensive practice. The literature of the subject is also very circumscribed; only two cases, so far as my research goes, have been reported in the pages of the 'Veterinarian,' and no English pathological work—either veterinary or medical—contains a precisely similar example.

Two cases of stringhalt have been brought to the college-yard for examination during the quarter. Into the history of one of these I have been induced to enter into details, because the case was not only a well-marked instance of the disease, but remarkable for the intense violence of the symptoms and their progressive inveteracy. The affected animal—a well-bred brown horse aged 12—belonged to a gentleman residing a few miles from Edinburgh. The servant who brought him, on the 4th of September, delivered to me a note from the owner, requesting my opinion, whether the case admitted of relief, or if I thought there was no hope of ultimate recovery, to have him destroyed. On the animal being walked out, the peculiar symptoms—so characteristic of this disease, and from which the popular name applied to it in some parts of the country, "White mare's click" is derived—presented themselves in the most severe form, and were painful in the highest degree to witness. I had no hesitation in conveying my opinion to the owner, that the case was beyond cure—utterly hopeless and irremediable. In the attempts which the animal made to walk, both hind legs were caught up with such force as to bring the anterior part of the fetlock in contact with the belly at every step. When the horse was placed in the stable, and an attempt made simply to move him from one side of the stall to the other, the spasmodic jerkings of the legs were indescribably harassing, the effort causing violent agitation of the animal's whole frame. On inquiry, I learned from the servant that he had the horse under his charge for several years, and had worked him sometimes in the plough and sometimes in the cart; in fact, that he had performed the ordinary work of a farm-horse. The affection, which was very slight when the horse was first purchased, had gradually increased from bad to worse, and had latterly become so aggravated that it was almost impossible to do anything with him; and as for getting his hind feet shod, it was dangerous even to attempt it. When suddenly moved, or spoken sharply to, the body became suddenly and convulsively affected, and the eyes appeared as if about to start from their sockets. The animal was kept for a few days for the purpose of ascertaining whether, under rest and quietness, the symptoms would in any way subside; but as no improvement took

place, I had him destroyed by opening the carotid artery. The operation speedily terminated both his sufferings and his life.

I requested Mr Strangeways to make a careful *post-mortem* examination. As this was an extreme case, I was impressed with the belief that, in all probability, some trace of the cause of this obscure disease might be discovered. Mr S., assisted by Dr P. Young, the lecturer on physiology and microscopical anatomy in the college, commenced their examination by exposing the brain and the spinal marrow from its origin to its caudal termination. These, with their respective coverings, were carefully and minutely examined, as was the spinal canal; but all were found entirely free from any abnormal appearance. The next step was to expose the large plexus of nerves, sacro-lumbar, from which the whole of the posterior extremities are supplied with both sensation and motion. This done, the whole of the branches leaving the posterior extremity of the spinal cord, and assisting in the formation of this plexus, were carefully examined, as were their several sheaths and the foramina through which they made their exit from the spinal canal; still nothing wrong could be discovered—no apparent discoloration or thickening. Next the large trunk-nerves proceeding from this plexus to the different parts of the hinder extremities were examined, more especially the greater sciatic nerve, generally supposed to be the one affected in the disease; a minute microscopic examination, however, proved all to be in a healthy state. The nerves were traced down the whole leg, from their origin to their termination, and they, with the areolar tissue surrounding them, examined; but still without any result. The large joints, more especially the stifle and hock joints, next claimed attention; but presented no abnormal appearance. I was desirous that these joints should be very minutely examined, owing to an opinion having been expressed to me by an old friend in a very extensive veterinary practice, that, after several *post-mortem* examinations of animals suffering from this disease, he considered it was caused by, or originated in, some affection of one or other of these joints. The bones of the vertebræ were next examined, but presented no signs of having been fractured, no anchylosis of any of their joints, nor yet any bony tumors or spiculæ, which might have caused irritation of the roots of either the sensory or motor branches of the nerves. The only abnormal appearance which was observed was in the extensor muscles of the leg and foot, which were very largely developed, and very hard and firm.

From the *post-mortem* appearances, the only deduction we could arrive at was, that the disease consisted in functional derangement of the nerves supplying the extensor muscles, occasioned by some morbid affection, which could not be detected even with the assistance of the microscope.

Since the above *post-mortem* examination was made, a letter

from a New York physician, named Dr Busteed, has appeared in the 'Veterinarian,' copied from the 'New York Spirit,' wherein he states, "that, after numerous dissections, he was inclined to believe that the disease was located in the hock-joint, and that the spasmodic action was caused by the friction of the tibia passing over an irritable ulcer on the astragalus." There seems to be no ground for such an opinion. What Dr Busteed has mistaken for an "irritable ulcer," is nothing more than a portion of the bone devoid of articular cartilage, and, so far from being a morbid product, is a sort of natural cavity, wherein, by a beautiful provision of Nature, joint-oil can be stored up for the better lubrication of the joint. These depressions, termed *Sulci*, may be found in most, if not in all the large joints, as explained by me in 1837 in a controversy I had with Mr Spooner, V.S., of Southampton, in the pages of the 'Veterinarian.'

In the October Number of the 'Veterinarian,' the one in which Dr Busteed's letter appears, are some observations of Professor Varnell of the London Veterinary College, where, although admitting the doubtful pathology of stringhalt, he, in my opinion, fully replies to and controverts Dr Busteed's so-called discovery.

During the quarter seven cases of nervous affections, exclusive of the two of stringhalt, have been registered. Five of these occurred in horses, the remaining two in dogs. First in the list are three cases of chorea, or St Vitus's dance. This disease, which consists in a series of involuntary spasmodic movements of one or more of the motatory muscles, arises in all probability from some irritation of the roots of the motor branches of the nerves proceeding from the brain or spinal cord. In the domestic animals, the affection is met with most frequently in the dog, and is of less common occurrence in the horse. Oxen, sheep, and pigs are, as far as my experience goes, exempted from it. In the dog it generally occurs as a sequel of distemper, although it occasionally depends upon intestinal irritation occasioned by the presence of worms. The two cases which presented themselves in the horse, occurred in animals brought to the yard for examination as to soundness. The first, on the 21st of July, showed no symptoms of unsoundness until an attempt was made to move him backwards, when the whole muscles of the hind quarters were thrown into violent spasmodic convulsions. The other case, on the 28th of July, presented the peculiar symptoms which have led horsemen to describe an animal suffering from these as a *shiverer*. When he is run out his progression is affected with a peculiar staggering gait, followed by a twitching of the muscles or shivering when the animal is allowed to rest. In neither case was any treatment recommended, as no advice was asked for, the horses having been brought simply for examination. The primary object, when called upon to treat this peculiar form of disease, is to get the bowels well opened, and afterwards to administer some nervine

tonic. The disease in its chronic stage is, however, at all times difficult to treat; the only prospect of arresting its progress and affording relief invariably occurs in recent cases and in young horses. In the dog the cases are even more unmanageable, especially when the disease supervenes on an attack of distemper. In such cases I have found most benefit from the insertion of a seton in the neck, and the free use of quinine and tonic medicines. The case of epilepsy occurred in a small Prince Charlie dog, belonging to a gentleman in town. The animal was very fat, and evidently lived on the good things of this life. He had periodical fits, accompanied by violent spasms, followed by coma. The fits lasted for a few minutes, and were gradually increasing both in frequency and intensity. From his appearance I had the impression that the disease depended a great deal on plethora; and I accordingly administered to him a good dose of purgative medicine, and ordered him warm baths, and to be fed on spare diet. The alvine evacuations were to be regulated by means of castor-oil. This plan of treatment, rigidly followed out, had the desired effect, the fits gradually disappearing as he fell off in condition. Of the remaining cases, one occurred of paralysis in the tail of a colt; another from injury of the spine, occasioned by a fall into the hold of a ship; and the third was a case of tetanus. The case of paralysis for which I was consulted occurred on the 21st of August, in a foal having no power to move his tail, which hung down suspended, as it were, over his dock, and was continually covered with dung. I ordered a blister to be applied to each side of the root of his tail, at the same time to administer tonic medicines, and to support the strength of the animal by good nutritious food. I regret not having it in my power to give further particulars of this case, the owner of the foal having been seemingly contented with receiving advice, without taking the trouble to inform me whether it was followed with success. The case of the injury of the spine produced the following symptoms—viz., a partial loss of power of the hind quarters, more particularly noticed when the animal was turned suddenly round or put back, on which occasions the hind legs appeared to lose their power completely, the animal coming down on his side. The treatment which I have found most successful in these cases consists of the repeated application of blisters along the course of the spine at the seat of the injury, with continuous attention to rest and quietness. The case of tetanus was a very mild traumatic one, yielding to the administration of strong purgatives, and repeated small doses of extract of belladonna.

Amongst the cases of wounds was one of such an extensive and frightful character as to deserve more than passing notice. It occurred on the 23d of September, in a grey horse belonging to a soda-water manufacturer in the city. On the day of the accident the animal was left in a light van in the street in charge of a boy, during the time the driver was delivering some goods. The boy, more in-

tent on play than work, left the horse's head, and something occurring to frighten the animal, he ran off at full speed. In his mad career he encountered another vehicle going in an opposite direction, violently dashing his chest against the shaft. The blow fractured the shaft, the splintered end of which entered the horse's breast in front of the shoulder, passing right under that joint, separating the whole of the muscles that attach the fore leg to the trunk. The wound extended along the ribs, nearly to the very hip-joint. I was sent for, but, being from home, Mr Worthington, my assistant, hastened to the spot; but on his arrival found the case to be a hopeless one, the animal rapidly sinking, partly from the great loss of blood and partly from the shock. The leg was nearly detached from the trunk, hanging to it merely by a portion of skin.

PROCEEDINGS IN THE LABORATORY.

By Thomas Anderson, M.D., Professor of Chemistry in the University of Glasgow, and Chemist to the Society.

I. ON THE COMPOSITION AND MANURIAL VALUE OF THE DUNG OF THE PIGEON AND OTHER DOMESTIC BIRDS.

In most works on agricultural chemistry pigeons' dung is described as a very valuable manure, and even compared with guano in its manurial effects; but the information regarding its composition is extremely scanty. It appears to have been first examined by Davy in the beginning of the century; but, as might be expected from the imperfect methods of investigation then in use, his analysis gives none of that information now considered necessary. He contented himself with determining the proportion of matters soluble in water contained in the recent and fermented dung, which he found to amount to 23 per cent in the former and only 8 in the latter case. He compares it to nightsoil, and remarks that it ought to be used as fresh as possible. A somewhat similar examination was made by Sprengel, who found 16 per cent of soluble matter in pigeons' dung which had been kept for six months. More recently, Boussingault found 8.5 per cent of ammonia in a specimen examined by him; and Johnston analysed a sample imported into this country from Egypt, which he found to contain*—

* In Johnston's paper this analysis is not expressed exactly in the manner here given, but I have rearranged the results in the form now generally used in manure analyses.

Water,	6.65
Organic matter and ammoniacal salts,	61.18
Phosphates,	7.96
Carbonate of lime,	2.37
Alkaline salts,	0.42
Sand,	21.42
	100.00
Ammonia,	5.46

According to these results, the dung may not unfairly be compared with guano, and, like it, might be expected to produce a very marked effect. Basing my opinion on this analysis, I have frequently urged on farmers the importance of collecting pigeons' dung, and using it more largely than is at present done; but the facts I am now about to detail have induced me to alter this opinion to some extent. Early in the present year two samples of pigeons' dung were sent to the laboratory by Mr Steadman of Boghall, near Roslin, who informed me that he was in the habit of using every year about 40 tons of the dung collected from the large pigeon-houses which abound in many parts of Mid-Lothian. For this manure he paid at the rate of £4 per ton; and having reason to suspect that some of that he had recently obtained was of inferior quality, he sent for analysis a sample of this, and another which he considered to be a fair average of that he usually obtained. His samples were found to contain—

	I.	II.
Water,	19.39	40.53
Organic matter,	43.11	25.15
Phosphates,	5.96	5.01
Sulphate of lime,	...	1.25
Carbonate of lime,	2.59	0.75
Alkaline salts,	0.35	0.16
Sand,	28.60	27.15
	100.00	100.00
Ammonia,	1.95	1.30

These results are so different from those obtained both by Johnston and Boussingault, that I was naturally led to trace the cause of so marked a discrepancy, and I was inclined to attribute it to vegetable *debris* which had been mixed with the dung. Both samples, in fact, contained fragments of straw, the husks of grain, and feathers, which had fallen into, and become mixed with, the actual droppings of the birds; and these, together with the sand, which had no doubt been partly scraped up from the bottom of the pigeon-houses in removing the manure, appeared to afford at least some explanation of the difference between these and Johnston's results. But, even making every allowance for this, it could scarcely be considered a sufficient explanation of differences of such magnitude, which could only be produced by a very large admix-

ture of foreign impurities, and it appeared necessary to trace the matter somewhat further. When a comparison is made between the analyses, after deduction of sand and water, a better idea is formed of the differences between the samples; as may be seen from the subjoined numbers:—

	Johnston.	No. 1.	No. 2.
Organic matter,	84.97	82.88	77.81
Phosphates,	11.05	11.46	15.50
Sulphate of lime,	...	...	3.89
Carbonate of lime,	3.29	4.98	2.31
Alkaline salts,	0.69	0.68	0.49
	100.00	100.00	100.00
Ammonia,	7.58	3.75	4.02

It thus appears that, so far as the proportions of organic matter, phosphates, &c., are concerned, the similarity of the three samples is very great, and that the chief difference lies in the composition of the organic matter, which is much richer in nitrogen in the sample examined by Johnston than in either of the others. In the former the organic matter is capable of yielding about one-eleventh of its weight of ammonia—and in the latter, not more than one-twentieth; which would seem to indicate that nearly a half of the dry matter consisted of vegetable substances poor in nitrogen—an opinion which the appearance of the samples by no means warranted.

In order to clear up this point, Mr Gibson of Woolmet was kind enough to collect for me a quantity of pigeons' dung, from his own pigeon-house, in as fresh a state and as free from foreign matter as it was possible to obtain it. The analysis of this sample gave the following results:—

Water,	58.32
Organic matter,	28.25
Phosphates,	2.69
Sulphate of lime,	1.75
Alkaline salts,	1.99
Sand,	7.00
	100.00
Ammonia,	1.75
Phosphoric acid in the alkaline salts, equal to 0.20 phosphate of lime,	0.10

If sand and moisture be deducted in this case, the results stand thus:—

Organic matter,	81.46
Phosphates,	7.75
Sulphate of lime,	5.04
Alkaline salts,	5.75
	100.00
Ammonia,	5.04

When these results are compared with those given by Mr Steadman's samples, it will be seen that the difference between them is not great. The quantity of ammonia is no doubt somewhat larger,

but it still bears a much smaller proportion to the organic matter, than in the Egyptian sample. The difference, I believe, is mainly due to the circumstances under which the dung is accumulated. In our cold and damp climate it retains its moisture for a long time, and fermentation taking place, ammonia is evolved and lost; while in the warm and dry atmosphere of Egypt, it is rapidly dried up before decomposition has set in, and the organic matter is retained more nearly in the condition in which it is deposited by the birds. The difference, in fact, is similar in kind, though not in degree, to that observed between Peruvian and other varieties of guano. The former, being deposited in a district in which rain never falls, has dried with rapidity, and passed into a state in which putrefaction is arrested, or at least brought into a condition in which ammonia no longer escapes from it, and here, accordingly, we find that substance to amount to nearly a third of the whole organic matter; while almost all other guanos, being deposited in places where rain is more or less abundant, have been reduced to the condition of phosphatic guanos, in which not only has a large proportion of the organic matter disappeared, but the loss has particularly affected the ammonia, which does not, in general, form more than one-tenth of the residual animal matters. It is quite possible that something may also be due to the presence of a large quantity of vegetable matters poor in nitrogen in the dung accumulated in our pigeon-houses; but the effect must be small compared with that produced by decomposition.

Although differences of opinion may exist as to its cause, there can be none as to the inferiority, in manurial value, of the produce of the pigeon-houses of this country, as compared with that analysed by Boussingault and Johnston. The samples of which analyses have been given above, cannot with any justice be compared with guano. They are much more similar to farmyard manure, although of very much higher quality. A good and well-made farmyard manure may yield 0.7 to 0.8 per cent of ammonia, and from 1 to 1.5 per cent of phosphates; while the average of the three samples of pigeons' dung amounts to 1.66 of the former, and 4.55 of the latter; and if those quantities be made the basis of calculation, the latter may be taken as worth about three times as much as the former. The proportion of these elements is generally understood to give at least an approximation to the relative values of different manures; but if, in addition, the amount of alkaline salts be taken into account, the balance will be turned against the pigeons' dung, which contains a very trifling quantity of these substances, while of potash alone, farmyard manure contains 0.6 to 0.8 per cent. On the other hand, owing to the facility with which it undergoes decomposition, pigeons' dung is an active manure, and from this circumstance it may, in some instances and in some soils, have an effect greater than might be anticipated from its composition alone;

but it would scarcely be advisable to estimate it at more than three times the value of good farmyard manure.

Hens' Dung.

No information whatever is to be found in books regarding the composition of the dung of different kinds of poultry; and, with the view of supplying this want, I gladly availed myself of Mr Gibson's offer to collect for me samples of the different kinds, all of which were analysed in the same manner as guanos, which seemed sufficient to determine their general value. The hens' dung was collected in as fresh a state as possible, and care was taken to keep it free from sand. It is possible that while being collected it may have lost some moisture, but the quantity cannot have been large:—

Water,	60.88
Organic matter and ammoniacal salts,	19.22
Phosphates,	4.47
Carbonate of lime,	7.65
Alkaline salts,	1.09
Sand,	6.69
	100.00
Ammonia,	0.74
Phosphoric acid in the alkaline salts, equal to 0.15 phosphate of lime,	0.07

Here the quality of the dung as a manure is considerably lower than that of the pigeon, more especially as regards the proportion of ammonia, which is extremely small, and scarcely higher than in good farmyard manure, to which it bears a close relation, except in the quantity of phosphates, which are high.

Calculated dry, and after deduction of sand, the hen's dung has the subjoined composition:—

Organic matter and ammoniacal salts,	59.26
Phosphates,	13.79
Carbonate of lime,	23.58
Alkaline salts,	3.37
	100.00
Ammonia,	2.27

The most conspicuous difference between this and pigeon's dung lies in the large amount of carbonate of lime, which here reaches nearly one-fourth of the dry matter. As a necessary consequence, the percentage of organic matter is considerably reduced, and the ammonia is also much lower.

Duck Dung.

This sample, like the last, was collected at Woolmet, every care being taken to avoid the presence of extraneous matter. It contained—

Water,	46.65
Organic matter and ammoniacal salts,	36.12
Phosphates,	3.15
Carbonate of lime,	3.01
Alkaline salts,	0.32
Sand,	10.75
	100.00
Ammonia,	0.85
Phosphoric acid in the alkaline salts,	trace.

Calculated dry, and after deduction of the sand, this gives—

Organic matter and ammoniacal salts,	85.02
Phosphates,	7.39
Carbonate of lime,	7.06
Alkaline salts,	0.53
	100.00
Ammonia,	1.99

In this case the small proportion of ammonia, amounting to less than one-fortieth of the organic matter, deserves notice. The quantity of phosphates is also small; and the carbonate of lime, though not so large as in the hen's dung, is considerable.

Goose Dung.

This dung was of a much more watery nature than any of the others, and after being kept for some time in a stoppered bottle, water exuded from it, and collected as a distinct layer. It contained—

Water,	77.08
Organic matter and ammoniacal salts,	13.44
Phosphates,	0.89
Alkaline salts,	2.94
Sand,	5.65
	100.00
Ammonia,	0.67
Phosphoric acid in the alkaline salts, equal to 0.26 phosphate of lime,	0.12

In this manure more than three-fourths of the entire weight consists of water, less than one per cent of phosphates, and about two-thirds of a per cent of ammonia, so that its quality is far from high. Calculated dry, and after deduction of sand, its composition would stand thus:—

Organic matter and ammoniacal salts,	74.92
Phosphates,	5.15
Alkaline salts,	19.93
	100.00
Ammonia,	3.88
Phosphoric acid in the alkaline salts, equal to 1.41 phosphate of lime,	0.69

The large amount of alkaline salts is here particularly worthy of

notice, and this forms the most important characteristic of this kind of dung.

The analyses here given do not place the dung of domestic birds in a very high position in the list of manurial substances, and they dispel altogether the vague notion current among farmers, and even expressed in some agricultural works, that it is to be ranked much in the same category with guano. So far from this being the case, they may be much more accurately placed by the side of farmyard manure. Goose dung, indeed, is rather inferior to well-made farm dung, and the droppings of the hen and duck very little superior to it. Pigeons' dung unquestionably stands on a considerably higher level than that of the other domestic fowls, although still very inferior in manurial value to even the worst qualities of guano. The quality of this manure, however, appears to vary considerably; and, so far as can be judged from the data at our disposal, the difference is in part due to decomposition, and the loss of ammonia in moist climates, although the nature of the food must unquestionably have some influence. It can scarcely be doubted that pigeons fed on pease (on which food they are known to fatten rapidly) must yield a manure much richer in ammonia than those fed on the much less nitrogenous grains of the cereals; and this opinion might be easily substantiated or disproved by experiment, did the importance of the subject merit a detailed investigation, but the quantity of pigeons' dung used is not sufficient to warrant the expenditure of much labour upon it. It may be fairly inferred also, that the quality of the dung of other birds must be modified by their food, and very possibly other observers may have an opportunity of examining specimens of hen, duck, and goose dung, of superior quality to those which have come under my hands; but it is not likely that the difference will be so large as to invalidate the conclusions drawn from the results now detailed.

These conclusions are, that pigeons' dung, as collected in this country, has a value not exceeding three times that of good farmyard manure, and that the other kinds of poultry dung scarcely, if at all, exceed it in value.

II. COMPOSITION OF ANGAMOS GUANO, AND OF THE ASH OF SOME KINDS OF GUANO.

Eight or ten years since, I published in the Transactions of the Society, analyses of a kind of guano imported from the mainland of Peru under the name of Angamos guano. It was found in small quantities on the ledges of the rocks frequented by sea-birds, and was collected by men who, in many cases, were lowered by means of ropes over the face of the cliffs, by which means only it could be procured. A considerable quantity of this guano was then imported; and as its quality was extremely high, it met with a ready sale, which led to its being collected from every spot at which it could be

found; and this was done so thoroughly, that the deposits, not being very large, was soon exhausted, and none has been imported for at least eight years. The haunts of the sea-birds having since then been left undisturbed, a new supply has accumulated, and several cargoes reached this country during the past year, one of which I have had an opportunity of examining, and its composition is of interest in relation to the circumstances under which guano is produced. It contained—

Water,	7.39
Organic matter and ammoniacal salts,	64.81
Phosphates,	9.10
Alkaline salts,	12.21
Sand,	6.49
	100.00
Ammonia,	23.40
Phosphoric acid in the alkaline salts, equal to 5.54 phosphate of lime,	2.56

Little being known as to the composition of the ash of different kinds of guano, a complete analysis was made in this case, and it was found to contain—

Peroxide of iron,	2.96
Lime,	17.24
Magnesia,	3.75
Potash,	8.35
Chloride of potassium,	4.55
Chloride of sodium,	5.42
Phosphoric acid,	24.07
Sulphuric acid,	4.19
Silicic acid,	1.38
Sand,	24.96
Charcoal,	2.46
	99.33

After deducting charcoal and sand, the residue will give the composition of the actual inorganic part of the dung of the sea-birds by which the guano was produced—

Peroxide of iron,	4.11
Lime,	23.97
Magnesia,	5.21
Potash,	11.65
Chloride of potassium,	6.32
Chloride of sodium,	7.53
Phosphoric acid,	33.47
Sulphuric acid,	5.82
Silicic acid,	1.92
	100.00

The most notable point in the composition of this guano is the very large amount of ammonia which the organic matter yields, in which respect it exceeds every other kind. In the best Peruvian guano the organic matter amounts to about 52 per cent, and it

yields 17 per cent, or almost exactly a third of its weight, of ammonia; but here the 64.8 per cent of organic matter gives 23.4 in place of 21.6 of ammonia, which is the quantity it ought to have given if it had been identical in composition with the organic matter of Peruvian guano. This difference indicates a less advanced decomposition, and shows that the organic matter is more nearly in the state in which it was originally deposited. It is probable, indeed, that it has not undergone much change, but on this point it is not possible to form any very decided opinion, in the absence of reliable analysis of the recent dung of carnivorous birds. I ascertained that the Angamos guano does not contain much ready formed ammonia, and is rich in uric acid (the great nitrogenous constituent of the dung of the carnivora); but the want of any satisfactory analyses of the droppings of sea-birds with which to compare the results did not hold out any inducements to make a more minute determination of their relative quantities. The only analyses of the dung of carnivorous birds on record were made by Coindet many years since, and their results are by no means satisfactory. They were made on the dry substance, and he states their composition as follows:—

	Senegal Eagle.	American Hunting-Eagle.	American Sea-Eagle.
Uric acid, . .	89.79	90.34	84.65
Ammonia, . .	7.85	8.87	9.20
Phosphate of lime, .	2.36	0.76	6.15
	100.00	99.97	100.00

The absence of all reference to alkaline salts, and the appearance of phosphate of lime as the only inorganic constituent, throws doubt on these analyses, and renders great caution necessary in drawing conclusions from them. It seems probable, however, that what is here set down as phosphate of lime was the entire ash of the dung, in which case the mineral matter must have borne a much smaller proportion to the organic substances than in any kind of guano known to us. Supposing what is set down as uric acid to be really that substance, the organic matter must be very similar to that of Angamos guano, as will be seen from the following table, giving the amount of ammonia which would be yielded by 100 parts of that contained in each of the substances:—

Senegal eagle, ...	43.7
American hunting-eagle, ...	44.8
American sea-eagle, ...	43.0
Angamos guano, ...	36.2

Without placing too much reliance on Coindet's experiments, which unquestionably require confirmation, and in all probability exaggerate the amount of ammonia in the dung, they may be fairly accepted as establishing the fact that Angamos guano is formed entirely from the droppings of sea-birds; and, as we shall pre-

sently see, it is highly probable that all other guanos have a similar origin. An opposite opinion has, however, been recently expressed, and the determination of the point is far from unimportant, because on it must depend the prospect of the reproduction of guano when the present supplies are exhausted. To this question we shall afterwards revert; but as far as Angamos guano is concerned, no doubts can exist as to its being produced from dung alone, for the position in which it is found almost precludes the introduction into it of any other substances; and it appears also to have undergone but little change, and that which has occurred has probably mainly consisted in the loss of organic matter—that is, of uric acid—by decomposition, and not in the escape of ammonia alone. Had ammonia disappeared, the residual organic matter would have been much poorer in that substance than it is actually found to be. In Peruvian guano the change has advanced somewhat further, and the ammonia has begun to diminish, but it is still very incomplete—undecomposed uric acid being still contained in it, though in smaller quantity. It would appear, indeed, that the first change which recently-deposited guano undergoes is the decomposition and loss of uric acid; and the extent to which this advances depends upon the amount of moisture present. It is active so long as the dung remains moist; and if, as happens in the rainless district of Peru, the dung rapidly dries, it is soon arrested; whereas, in damp climates, every fall of rain excites a new decomposition, by which the amount of organic matter is gradually diminished, uric acid being destroyed—and at length only the less destructible animal matters, which are also poorest in nitrogen, are left behind. This is particularly seen in Ichaboe guano, which, as now imported, is of recent formation, the old deposits having been entirely removed some years since. The following analyses of samples imported during the past year illustrate this point very strikingly :—

	I.	II.	III.
Water,	29.25	18.58	19.90
Organic matter and ammoniacal salts,	35.01	32.49	44.33
Phosphates,	13.80	15.82	20.21
Sulphate of lime,	1.63	1.01	1.38
Carbonate of lime,	0.39	5.80	0.41
Alkaline salts,	8.12	0.42	4.04
Sand,	11.80	25.88	9.73
	100.00	100.00	100.00
Ammonia,	11.01	9.14	7.93
Phosphoric acid in the alkaline salts,	0.76	trace	0.28
Equal to phosphate of lime,	1.54	trace	0.61

In the two first of these samples the ammonia forms nearly one-third of the whole organic matter, but it is much smaller than this

in the last; and the difference is equally marked in the old Ichaboe, as may be seen from the subjoined table giving the amount of ammonia yielded by 100 parts of the organic matter in each case :—

No. 1,	31.4
No. 2,	28.1
No. 3,	17.8
Average old Ichaboe,	21.6

The progressive change in the organic matter is remarkably well seen in the first three samples, which show the change from a quantity of ammonia not very different from that found in Peruvian guano, down to little more than half the amount. In the latter case, it is probable that some particular circumstance must have affected the decomposition, which has advanced further than in average samples of old Ichaboe. Possibly that sample may have lain in a damp hollow.

Passing from these to the kinds of guano in which the decomposition has advanced still further, Bolivian guano may be selected as an example, because, more than any other of the so-called phosphatic guanos, it is obtained free from foreign admixture. A good sample of this variety contained—

Water,	12.80
Organic matter and ammoniacal salts,	10.35
Phosphates,	58.30
Sulphate of lime,	1.73
Carbonate of lime,	2.74
Alkaline salts,	1.72
Sand,	12.36
	100.00
Ammonia,	1.75
Phosphoric acid in the alkaline salts, equal to 1.34 phosphate of lime,	0.64

A detailed analysis of the ash of this guano gave—

Peroxide of iron,	3.87
Lime,	31.47
Magnesia,	3.74
Potash,	1.40
Soda,	8.37
Chloride of sodium,	0.77
Phosphoric acid,	36.22
Sulphuric acid,	0.48
Sand,	13.68
	100.00

A hundred parts of the organic matter of this guano contain only 16.9 of ammonia, and even this is above the average, many samples yielding only 10 or 11 per cent. In this variety the evidence of advanced decomposition of the organic matter is complete. Uric acid can no longer be detected, and the residue clearly consists of

the less decomposable animal substances contained in the dung of the birds.

It has been already remarked that doubts have been recently expressed as to whether guano has been entirely derived from the dung of birds. The subject has been fully discussed, and the arguments for supposing it to be partly derived from other sources have been fully stated in the Jury Report of the Exhibition of 1862. No one doubts that the excrement of the birds living on the guano islands must yield a large, probably by much the largest, part of the guano; but it is alleged by the supporters of the view in question, that a considerable portion of it is derived from the carcasses of the birds which inhabit them. It is well known that the remains of sea-birds were found in the old Ichaboe guano, but what proportion they bore to the entire deposit has never been ascertained. I do not know whether they have been found in the guano recently accumulated on that island, but feathers certainly form an invariable, though not a large, proportion of that now imported. Neither bones nor feathers, however, have ever been found in Peruvian guano, or any other deposit, except the old Patagonian guano, now no longer imported, which contained a very perceptible amount of the latter; and it can scarcely be doubted that, if the remains of birds had formed any considerable part of ordinary guanos, traces of feathers, which resist decomposition for a longer period than any other animal substance, ought to be found in them.

The composition of the organic matter appears also to be fatal to the idea that any large proportion of guano can be derived from the flesh of the birds. In the preceding pages it has been shown that, in Peruvian and recent Ichaboe guano, nearly one-third of the organic matter consists of ammonia, or at least yields that substance; and in this respect it does not greatly differ from that of the recent dung of carnivorous birds. But the organic matter contained in flesh yields, in its recent state, only 14.2 per cent of ammonia, and often less; and as the decay of flesh produces ammonia, part of which would inevitably be lost, it would follow that, if any considerable portion of Peruvian guano were derived from flesh, the percentage of ammonia yielded by it ought to be very much smaller than it actually is. In point of fact, the composition of Peruvian guano is exactly what might be anticipated from all that is known of that of the excrement of carnivorous birds, which is rich in decomposable nitrogenous compounds; and it is easy to see, that just in proportion as the conditions likely to promote that decomposition occur, so does the amount of organic matter diminish. Peruvian guano is exactly like Angamos guano which has undergone a more complete decomposition; and the guanos of damp climates, such as recent Ichaboe, contain an organic matter almost identical in composition with that of Peruvian guano; while in the older and more decomposed deposit, the proportion of

ammonia was much smaller—a result to be anticipated from what is known regarding the changes these nitrogenous compounds undergo.

It cannot by any means be asserted that no part of a guano is produced from the remains of dead birds, but it appears unquestionable that, if it is, the quantity is so small as to be scarcely worthy of notice, and we may fairly conclude that it is to the accumulation of dung that we must look for a new supply of guano when the present deposits are exhausted; and it will be a matter for consideration whether anything can be done to promote its accumulation.

III. COMPOSITION OF A GUANO CONTAINING SALINE MASSES.

Some time since a guano was sent to the laboratory containing a number of saline masses. The place from which it was imported was not mentioned, and I have been unable to obtain any further information regarding it, but it bore a remarkable resemblance to damaged Peruvian, having a dark brown colour and the other characteristics of that guano. It contained—

Water,	16.60
Organic matter and ammoniacal salts,	27.12
Phosphates,	28.85
Alkaline salts,	16.18
Sand,	11.25
	100.00
Ammonia,	7.28
Phosphoric acid in the alkaline salts, equal to 5.96 phosphate of lime,	2.75

From the general composition of this sample, I was forcibly reminded of some Peruvian guanos, containing hard saline masses, I had examined some time before, and I thought it advisable to analyse those contained in this sample. Some of the masses were accordingly picked out and scraped with a knife, for the purpose of removing the guano adhering to their surface, but it was found to be so thoroughly disseminated through them that it was impossible to separate it. After as complete separation as was possible, the sample analysed contained 61.94 per cent of ash, and must therefore have retained a considerable quantity of the actual guano. Its ash contained—

Peroxide of iron,	3.81
Lime,	23.02
Magnesia,	4.21
Potash,	3.55
Chloride of potassium,	5.67
Chloride of sodium,	20.80
Phosphoric acid,	21.15
Sulphuric acid,	11.14
Silicic acid,	1.36
Sand,	4.94
	99.65

These numbers appear to show that the sample must have been from the lower part of a deposit which had been exposed to the sea. The reduced amount of organic matter indicates a more advanced decomposition, due to moisture, and that this must have been sea-water is clear from the very considerable proportion of common salt. This, however, will not explain all; and it seems probable that the sea-water must have percolated through the upper strata of the guano, and washed down some part of the alkaline salts containing potash to the lower part of the deposit. There is no doubt that, if the history of most guano-deposits could be traced, similar changes would often be observed.

IV. ON THE COMPOSITION OF SOME OF THE MORE IMPORTANT WEEDS INFESTING CULTIVATED SOILS.

Little attention has as yet been paid to the composition of the weeds infesting the soil, and their action upon it, whether exhausting or otherwise. The ash of a few has been analysed; but as far as the great majority of them is concerned, no definite information is to be found, though many well-known facts indicate the importance of more accurate knowledge, and many statements have been made regarding them which, to say the least of it, require confirmation.

There is little doubt that a knowledge of the composition of the weeds found abundantly in any soil might often assist us in forming an opinion as to its nature; for there is no fact better established than that certain plants are found only on particular soils, and it has been naturally supposed that they flourish there because they find an abundant supply of congenial food. Certain plants, for example, are found only on calcareous soils, and it has been supposed that they grow there because they require and find abundance of lime, which is contained, or supposed to be contained, in large quantity in their ash. Common coltsfoot is one of those plants which are considered to be an infallible indication of the presence of lime in the soil; and the rank and luxuriant growth of certain grasses is supposed to be a proof that much soluble silica is contained in others. The statements in question are an extension of the opinion entertained by Liebig, that all plants may be divided into three classes—*potash*, *lime*, and *silica* plants—distinguished by yielding an ash containing a preponderating quantity of either of those substances, and consequently growing luxuriantly only on soils containing them in abundance. How far these views are well founded it is not my intention to discuss at the present moment, my object being to place facts on record, and when these have accumulated in sufficient number will be the proper time for considering the deductions to be made from them.

I had originally intended to examine only the ash of the different weeds, but as not only its composition but its percentage in the plant seemed of importance, I was led to extend my experiments to

the determination of the amount of water and nitrogenous matters contained in it, so that, in the event of any of them forming under any circumstances part of the food of animals, their value might be approximately ascertained. The plants were all collected when in full flower, some of them in the neighbourhood of Glasgow, others near Dalry in Ayrshire. As soon as they were received at the laboratory, a portion was weighed off for the determination of moisture, and the rest was spread out to dry in a thin layer. In general the portion taken for the water was selected so as to give a fair proportion of stems, leaves, and roots; but in some few cases those different parts were separated, and analysis made of each. It is not necessary to enter into any special details regarding the mode in which the analyses were made, which presented nothing peculiar.

Coltsfoot (*Tussilago farfara*).

In this particular case, as the flowers appear before the leaves, the plants were collected after flowering. They were gathered on the 4th June, from a very sandy soil overlying clay, and carefully dug up so as to obtain the whole of their long and deeply-penetrating roots. The ash contained an unusually large quantity of sulphuric acid, part of which was reduced to the state of sulphur in burning, so that above a per cent of this substance appears in the analysis:—

Water,	86.66
Albuminous compounds,	1.94
Other organic matters,	9.27
Ash,	2.13
	100.00
Nitrogen,	0.31

The ash contained—

Peroxide of iron,	0.95
Lime,	19.52
Magnesia,	8.19
Potash,	19.92
Chloride of potassium,	9.94
Chloride of sodium,	4.09
Phosphoric acid,	4.16
Sulphuric acid,	24.52
Sulphur,	1.20
Carbonic acid,	2.85
Charcoal,	0.74
Sand,	3.79
	99.87

Re-calculated after deduction of sand, charcoal, and carbonic acid, this gives:—

Peroxide of iron,	1.02
Lime,	21.10
Magnesia,	8.86
Potash,	21.54
Carry forward,	52.52

Brought forward,	52.52
Chloride of potassium,	10.75
Chloride of sodium,	4.45
Phosphoric acid,	4.44
Sulphuric acid,	26.55
Sulphur,	1.29
	100.00

Common Thistle (*Cnicus lanceolatus*).

The plants were collected on the 6th July, from a good sandy loam. They were of large size, and the stems and leaves were separated, and the quantity of ash and nitrogen in each determined. The ash analysis, however, was made on the entire plant:—

	Stems.	Leaves.
Water,	82.06	85.52
Albuminous compounds,	1.19	3.12
Other organic matters,	15.39	9.05
Ash,	1.36	2.31
	100.00	100.00
Nitrogen,	0.19	0.50

The ash contained—

Peroxide of iron,	2.39
Lime,	21.65
Magnesia,	6.04
Potash,	14.98
Chloride of potassium,	20.23
Chloride of sodium,	4.24
Phosphoric acid,	3.54
Sulphuric acid,	3.25
Silicic acid,	2.27
Carbonic acid,	13.78
Charcoal,	0.63
Sand,	6.60
	99.60

And re-calculated after deduction of sand, charcoal, and carbonic acid, the numbers stand as follows:—

Peroxide of iron,	3.04
Lime,	27.54
Magnesia,	7.69
Potash,	19.07
Chloride of potassium,	25.76
Chloride of sodium,	5.39
Phosphoric acid,	4.50
Sulphuric acid,	4.13
Silicic acid,	2.88
	100.00

Field Mustard (*Sinapis arvensis*).

The plants were collected on the 1st July, and grew on a sandy loam with a clay subsoil. The plant belonging to a family which contains a volatile oil, rich in sulphur, it seemed interesting to ascertain what portion of the sulphuric acid found in the analysis of the ash existed in the plant in the form of sulphur. For this pur-

pose a portion of the plant was boiled with hydrochloric acid, and the quantity of sulphuric acid pre-existing in the plant was found in the solution. Another portion was treated with fuming nitric acid, and the excess of sulphuric acid over that in the previous experiment gave the amount of sulphur present in the plant in an unoxidised form.

Water,	80.45
Albuminous compounds,	3.62
Other organic matters,	13.92
Ash,	2.01
	100.00
Nitrogen,	0.58
Sulphuric acid (ready formed),	0.18
Sulphur,	0.02

The ash contained—

Peroxide of iron,	3.12
Lime,	28.42
Magnesia,	2.60
Potash,	16.39
Soda,	1.45
Chloride of sodium,	9.30
Phosphoric acid,	10.12
Sulphuric acid,	11.69
Silicic acid,	trace
Carbonic acid,	11.71
Charcoal,	0.20
Sand,	4.21
	99.21

Sand, carbonic acid, and charcoal being deducted, the ash has the following composition :—

Peroxide of iron,	3.75
Lime,	33.71
Magnesia,	3.62
Potash,	19.72
Soda,	1.75
Chloride of sodium,	11.20
Phosphoric acid,	12.18
Sulphuric acid,	14.07
Silicic acid,	trace
	100.00

Common Nettle (*Urtica dioica*).

The plants were gathered on the 5th July, and were of large size and in full flower. Soil, a sandy loam. Leaves and stem were separately analysed, and the proportion of each in the plant was also ascertained to be as follows :—

Stem,	47.48
Leaves,	52.52
	100.00

	Stems.	Leaves.
Water,	82.06	75.65
Albuminous compounds,	2.12	5.87
Other organic matters,	14.16	14.14
Ash,	1.66	4.34
	100.00	100.00
Nitrogen,	0.34	0.92

The ash contained—

	Stems.	Leaves.
Peroxide of iron,	2.49	5.09
Lime,	15.95	28.96
Magnesia,	4.68	6.70
Potash,	31.64	10.96
Chloride of potassium,	11.42	1.70
Chloride of sodium,	4.12	3.05
Phosphoric acid,	4.28	8.20
Sulphuric acid,	4.87	8.40
Silicic acid,	...	6.40
Carbonic acid,	17.44	6.19
Charcoal,	0.24	0.74
Sand,	2.20	14.00
	99.33	100.39

After deducting sand, charcoal, and carbonic acid, we have :—

	Stems.	Leaves.
Peroxide of iron,	3.14	6.40
Lime,	20.08	36.45
Magnesia,	5.89	8.43
Potash,	39.83	13.80
Chloride of potassium,	14.37	2.15
Chloride of sodium,	5.18	3.83
Phosphoric acid,	5.38	10.30
Sulphuric acid,	6.13	10.58
Silicic acid,	...	8.06
	100.00	100.00

Buttercup (*Ranunculus repens*).

Collected on the 8th July, and grown on a strong clay soil :—

Water,	85.15
Albuminous compounds,	1.31
Other organic matters,	10.87
Ash,	2.67
	100.00
Nitrogen,	0.21

The ash contained—

Peroxide of iron,	2.94
Lime,	13.64
Magnesia,	4.98
Potash,	26.84
Soda,	5.15
Chloride of sodium,	10.67
Carry forward,	64.22

Brought forward,	64.22
Phosphoric acid,	3.54
Sulphuric acid,	5.60
Silicic acid,	4.20
Carbonic acid,	14.23
Charcoal,	1.56
Sand,	5.96
	99.31

Sand, charcoal, and carbonic acid being deducted, this gives :—

Peroxide of iron,	3.79
Lime,	17.59
Magnesia,	6.42
Potash,	34.61
Soda,	6.64
Chloride of sodium,	13.76
Phosphoric acid,	4.56
Sulphuric acid,	7.22
Silicic acid,	5.41
	100.00

ON RECENTLY INTRODUCED CONIFERÆ:

To ascertain the Progress of Coniferæ introduced within the last Thirty Years, and the most suitable Relations of Soil, Altitude, Exposure, &c.

By Robert Hutchison of Carlowrie, Kirkliston.

[Premium—The Gold Medal.]

During the last thirty years, no branch of arboriculture in this country has received greater attention than the introduction and cultivation of the order *Coniferæ*, or Pine family; and it may therefore be a subject in itself interesting, and worthy of investigation, to ascertain how many and which of the varieties thus experimentally introduced have succeeded, or are destined to be found flourishing vigorously a century hence; what varieties, in short, of the many planted so promiscuously, are most likely to carry out best the intentions of the planter, who begins his work in the spirit of the old Roman, that he is benefiting not himself but his posterity—planting trees *quarum aspiciet baccam ipse nunquam.*

Amongst the numerous genera introduced, there are many beautiful varieties from India, the Himalayas, Affghanistan, Chili, and the Andes; while California, British Columbia, and the north-west provinces of America have themselves furnished a large collection.* These now grace with their luxuriant and evergreen foliage many of our lawns and pineta, in some situations vying even in hardihood with our well-known spruce and common Scots fir. Instances, no doubt, have occurred where some of the species, whether from injudicious planting in soils unadapted to their nature, or from improper treatment, have disappointed the hopes of their planters, and have thus tended to bring discredit upon the whole tribe.

Fortunately such cases form the exception rather than the rule; and while there are a few varieties which, we must admit, are unsuited to our Scottish climate, we hope to show that the great majority of those Conifers—more particularly such as the Highland and Agricultural Society of Scotland desire information as to their success and progress—will be found in many localities thoroughly acclimatised, and flourishing almost in that pristine beauty which first attracted the eye and attention of the botanical explorer in their native habitats.

With the view of endeavouring to supply such information in relation to soil, altitude, and exposure as the Society desires, we have obtained, in the prescribed form, returns from sixty-five stations through-

* It is proper to state that this Report was written in the autumn of 1862, from information collected then, consequently before any idea could be formed of the hardihood of the Japan pines which have since been introduced, and which may be treated of at some future period.

out twenty-seven different counties in Scotland, and from as wide a range of elevations as possible. Several of these schedules (which we have appended to this Report) will be found to contain the particulars of species which have already attained to timber-yielding dimensions, and are thus both interesting to the admirer of the pine tribe, and at the same time enable us to form some idea of the capabilities of these new species, and their utility for general economic purposes. In collecting these statistics we have endeavoured to obtain them from the best and most reliable sources; and while we are indebted to those who have kindly furnished them, we regret having been unable to obtain access to a larger number of enterprising and intelligent cultivators who possess well-established pineta.

It is interesting to observe how many, chiefly of the larger specimens of these comparatively recent importations, have withstood the severity of the winter of 1860-61, or are now recovering from the effects of that memorable season. This is in itself a conclusive proof, in the case of many of the species, of their hardihood and aptitude for our climate; and since it appears that of some of the varieties the small plants perished, while the taller and older specimens survived, or were only tarnished, it may be concluded that, if by care and judicious treatment, by shelter or otherwise, small plants can be reared beyond the *hoar-frost level*, or ground mists, they will then be found to succeed well, and to make more rapid and satisfactory progress. This holds good especially of the slower-growing kinds, such as the Picea Cephalonica, Picea Pinsapo, Pinus Lambertiana, and, in some instances, of Picea Nobilis. One excellent mode of attaining this desirable object is by planting these varieties in clumps, or even singly amongst a thickly-studded nursery of Haginoe fir, which as a nurse cannot be surpassed, being better adapted for that purpose, and a more rapid grower, than the common Scots fir; while its strong foliage and close habit effectually ward off those cutting winds which frequently disturb and destroy the growth of the more tender pines.

In their natural habitats, Coniferæ will, generally speaking, be found to prefer a soil the principal component of which is the *debris* of granitic rock upon a dry subsoil; and although it may therefore be inferred that this is best adapted to their habits, it by no means follows that they will not thrive in soils of other descriptions. Several of the North American and Californian pines thrive best in a rich, damp, or even *wet* loam, upon a *wet* subsoil, or upon ground surcharged with moisture. Of this nature are the Wellingtonia Gigantea and Cryptomeria Japonica, which will not succeed in a light dry soil; in fact, the former will scarcely live in such a situation, for the growth which it makes in one season dies off the next, leaving the plant at the end of a few years little if any larger than when first planted. In a deep, damp, peaty soil it also thrives well; and the Abies Menziesii and Picea Pichta also succeed best in similar ground. A singular instance of the preference of these pines

for a *wet* soil may be stated. At Balgowan (200 feet elevation), Perthshire, they are not thriving vigorously in a dry loamy soil; while at Keillor, in the neighbourhood (560 feet elevation), upon a high peaty moorland, partially drained and naturally wet, they do very well, and there are many large and handsome specimens. A large and very beautiful example of the Wellingtonia Gigantea is at Rosehall, near Falkirk (160 feet elevation), growing in a deep loamy soil, upon a wet sandy subsoil, and it has now attained, in perfect symmetry, nearly 13 feet in height. At Riccarton (Mid-Lothian), from 300 to 350 feet elevation, there are several fine large plants—one, in particular, about 12 feet high; and at Rockville, near Linlithgow, Mr Adie, C.E., possesses as handsome and large a specimen of this noble pine as may be seen in any collection. It is now (Dec. 1863) about 12 feet in height. The thickness and robust character of the stem of this valuable acquisition to our coniferous collections, its hardiness, even in very exposed situations and under extreme degrees of frost, fix its value unquestionably as *the best* pine yet introduced, and as one of our most justly esteemed and beautiful evergreens.

It must be borne in mind that those varieties which prefer a damp soil are the exception; for, as a rule, we find that in this climate Coniferæ do least good in ground of a close, stiff, retentive, clayey nature upon a wet bottom; and they will not do at all upon the chalky formations. A substratum of gravel is well adapted for their healthy development, as it drains off the water from their numerous rootlets and fibres; and it is a curious fact, that upon such subsoils most of the Coniferæ named in the lists in our Appendix stood the winter of 1860-61 better than the same varieties upon *wet* subsoils, *although at similar altitudes, where the frost was far less intense.*

The firs (Abies), whose roots run nearer the surface of the ground, do not necessarily require so deep a soil as the Pinus (true pine), Picea (silver firs), Larix (larches), cedars, cypresses, junipers, yews, and araucarias; but they will be found to thrive most vigorously upon a sandy loam with a cool subsoil of sand or gravel.

There are many good specimens of the Araucaria Imbricata mentioned in our Appendix, warranting the conclusion that, notwithstanding the many cases of failure, it will thrive better in a light gravelly soil, even with great exposures, than in rich loam in sheltered places. Many of the failures may doubtless be attributed to its having been planted in *a too rich* and *fine* soil. At Dunrobin, in Sutherlandshire, there are several fine specimens exposed to all weathers, and perfectly hardy; and at Dinimarle, on the banks of the Forth, near Culross, it is growing vigorously in a cold clay soil, with a stiff clay subsoil and open exposure. Young plants will be found to agree well with plenty of manure as a top-dressing to their roots; and in cases where little progress has been made for years, this application will be found a most beneficial and effectual stimulant. At Cairnsmore, in Kirkcudbrightshire, which may be styled

"the Devonshire of Scotland," at an elevation of 200 feet, there is a noble specimen of this Chilian Pine, 30 feet in height, and 4½ feet in girth at 2 feet from the ground.—(*Vide* Return No. 4.) It is planted in a light garden loam, but is unfortunately becoming bare and slightly decayed in the lower branches, probably from its roots having now penetrated to the subsoil, which is a white till.

Cedrus Deodara requires a dry subsoil; indeed, whatever be the nature of the upper soil in which it is planted, *that* appears an essential requisite to its vigorous growth, and it generally succeeds best in a sandy loam in situations not exposed to wind.

A good free loam of average depth will, in most cases, suit the majority of the other Conifers named in the lists, and many of them have succeeded well even upon a poorer soil, provided it be drained and that there be some degree of altitude in the situation. Upon a thin soil over whin-rock the Cedrus Atlantica will be found a miserable failure; but upon a deeper and better soil, with a more genial subsoil, in spots sheltered from high wind, or if nursed until from 8 to 10 feet high amongst common and strong-foliaged firs, this will be found a very beautiful and hardy variety.

Abies Morinda, Picea Cephalonica, and Pinus Macrocarpa require a very strong, rich, and deep loam; but in many localities we have found these varieties, especially the first mentioned, *unsuited* to this country, owing, we think, to its putting forth its young buds too early in spring, which thereby get nipped and checked by the frosty nights and winds of March. We notice, however, one good specimen said to be thriving vigorously at Newton, in Aberdeenshire, at an elevation of 300 feet, in a good clay loam upon a clay subsoil.

Pinus Laricio does not thrive well in light soil upon dry subsoil, but, like the Abies Menziesii, prefers a damp bottom.

We come now to notice the altitude at which these Conifers have thriven best and made most progress since their introduction to this country. This is a point regarding which there need be little doubt. In eight cases out of ten, the higher elevations (especially if sheltered from wind) will be found best adapted for their rapid and hardy development. In such situations not only is the frost less intense, but they enjoy comparative immunity from the *haar* and mists which exert so pernicious an influence on the young buds and terminal shoots of many of the slower-growing and more tender varieties; frequently, with mistaken kindness, planted in valleys and low-lying situations.

Regarding exposure, as in the case of altitude, there is little room for remark. In almost every pinetum the finest specimens are invariably found on the highest parts of the ground, *provided there be shelter from wind.* We consider a northerly exposure most suitable to the requirements of the pine family generally. It retards their too early development of young buds in spring, which a southern aspect, exposed to the sun's rays, is apt to induce; and again in winter, their frost-festooned foliage and snow-clad branches are, in

frosty nights, protected from the influence which the mid-day sun, melting the icy covering, would otherwise exert to their injury and almost certain destruction.

Pinus Lambertiana, Macrocarpa, and Picea Cephalonica are very liable to suffer from this cause, and should always, if possible, be placed in "back-lying" situations. We have known Pinus Macrocarpa thrice tried in one pinetum, and it always failed for the reason just assigned.

In exposed positions, many of the species lose their leaders, both from the effects of frost and blasts in winter; and as they are thus deprived of the chief essential to their future progress and symmetry, it is of importance to guard against such a casualty by planting them amongst nurses of the common spruce or Scots fir, and affording as much shelter as possible when young. It is, however, fortunate that new leaders are rapidly formed by several of the Conifers when the old ones are injured; and of those most prone to repair such a loss, we may notice the Abies Douglassi and Pinus Pinsapo.

No correct conclusion can be drawn from the state of pines planted in the neighbourhood of large towns, as their exposure to smoke is so great, and it exercises, to such an extent, so injurious an influence on their growth and development. No shelter from wind, elevation of altitude, or even good soil, will effectually remedy this evil; but it is not surprising that the rarer Coniferæ should disappoint the hopes of planters in such situations when the common spruce will not thrive in them. At Merrylee, near Cathcart, for example, spruces do very well when young, and until about twenty years old, after which they either become stationary in growth, or give way gradually, and assume a most miserable appearance. May it not, therefore, be worth consideration, whether plants got from nurseries in the immediate vicinity of cities or large towns are not so affected by the smoky atmosphere as to be retarded thereby in their growth for some years after their removal?

Several of the Conifers make very large annual growths of young wood. At Castle Kennedy, the Pinus Insignis, for example, is in many cases growing from 3 to 4 feet every year; and Picea Nobilis near Falkirk, actually grew 9 feet in three years, and is now fully 16 feet high; and this season, at Carlowrie (Linlithgowshire), Abies Douglassi grew 10 inches in two months, while Wellingtonia Gigantea added fully 2 feet to its height in the same time; besides which many other examples might be adduced. These should therefore be placed in exposures well calculated to facilitate the full ripening of the young wood of such extraordinary growths.

We may here notice a very good example of the advantage to be derived from planting in spots sheltered from wind, which presents itself in the pinetum at Stonefield (Argyleshire). This place, with an elevation of 200 feet, contains one of the most thriving collections to be met with anywhere—arising, in a considerable measure (although not entirely, as the situation is near the coast, and within

the influence of the Gulf-stream), from due attention having been given to shelter them from such winds as prevail in the district.

The damaging effects of wind upon pines, to which, in a great degree, we ascribe so many of the failures which planters have experienced in this climate, are, perhaps, best illustrated by the fact that, when placed in shelter, they thrive well until their leaders and upper branches shoot above the shelter line, when the part thus exposed gets swayed by the wind, and assumes in a very short time quite a bent and lateral habit.

Another very injurious influence upon the pine family, and indeed upon all forest trees and vegetation generally, is that exerted by the sea-breeze, especially along the east coast of Scotland. In Sutherlandshire, where all the foreign pines are found to succeed very well, any damage sustained in the winter of 1860-61, is ascribed by Mr Mathieson more to that cause and to undue confinement than to the effects of the intensity of the frost.

Having thus briefly noticed the principal varieties of the Coniferæ contained in the list of the Highland and Agricultural Society of Scotland, in their relations to soil, altitude, exposure, &c., we would refer any one interested in the matter for fuller particulars on these heads to our Returns; and we may be permitted, before concluding this paper, to offer a few remarks regarding the treatment of those varieties which seem best adapted to the vicissitudes of our climate in the majority of instances.

Although, to attain anything like maturity in a climate hitherto foreign to them, trees require soils and exposures peculiar to their respective natures and habits, it is also a very important element with every judicious planter that the seed be procured from a healthy and robust stock; and in the case of pines, it is well to obtain it, if possible, from the healthiest specimens in their own native habitats. Plants originated from such germs are more likely to inherit the hardiness and strength of the original, and to possess all the family qualities in a more satisfactory degree than such plants as are raised only from cones produced in this country, or are propagated by grafts or cuttings. Many of the coniferous tribe, even in their native soils, do not produce cones freely until they have attained a great age; and in our climate an abundance of cones, where the tree has not arrived at maturity, is a proof only of a sickly and degenerate habit; and the fewer the cones, the more robust and vigorous is the plant. Can, then, a healthy progeny be expected from seeds procured from the cones of trees so lately introduced to this country?

The practice of propagating these rarer Coniferæ by grafts or cuttings is highly reprehensible. A grafted specimen always partakes of and retains the habit of the branch by its lateral growth, fails to produce a good leader, and consequently never becomes a good specimen or a valuable tree. No doubt, the process may do very well where it is not contemplated to rear timber-yielding

trees, but only garden or lawn evergreens; but at the best this mode of propagating them is a very slow one; the ligatures and coverings over the grafted part require to remain for about two years after the operation ere they may with safety be removed and a good strong juncture be effected; if they should be withdrawn sooner, success will almost certainly be defeated. One evil often arising from grafting is the proneness of the graft to increase much faster than the stock, thus overweighing it and leading to a shattered stem. This may, however, to a great extent, be remedied by making scores with a knife from the stock over the graft at the juncture, and then earthing it up. A grafted specimen of Picea Nobilis (at Wauchope, Roxburghshire), treated in this manner, had its growth reduced in the first year after the process to about *four* inches; next season it attained 8 inches, and has grown 1 foot every year since, and the stock has now acquired sufficient vigour and strength to carry the graft. At Pitfour (Perthshire) a grafted Abies Douglassi, although now fourteen years old and 13 feet high, still retains the character of the branch; and at Cairnsmore (Kirkcudbright) a grafted Picea Nobilis, now eight years old and 6 feet high, was very long in forming a leader—a fault by no means uncommon amongst grafts. To remedy the evil, it was transplanted when *four* years old, and removed to a different situation and soil, after which it grew rapidly, and has at length formed a good terminal shoot. The most certain mode of promoting the formation and growth of a good leader in grafts is by frequent lateral or side-shoot pruning, or "foreshortening," in their young state. In such circumstances Picea Nobilis requires very hard and constant pruning, and is much benefited by it. In fact, when young, many of the pine tribe are improved, and a vigorous and rapid progress induced, by the judicious yet free use of the knife. Abies Morinda and Picea Pinsapo particularly require and are much accelerated in growth by pruning; and at Keir this has been very successfully tested by that very intelligent cultivator, Mr Niven, whose return in our Appendix (No. 42) will be found very interesting. We have known common spruces, when foreshortened, greatly improved, and increased in timber dimensions to about a third more than others grown beside them *un*pruned, or untouched by the pruning chisel at all. In truth, we incline to think that Conifers generally may be thus treated with greater advantage than many planters are aware of, or will admit. In the Keir grounds, we may remark, as illustrative of the difference in growth after a few years between a grafted specimen and one of the same species on its own roots, that a Pinus Macrocarpa, grafted, and now fifteen years old, is about 14 feet high; while one on its own roots of the same age is now 17 feet high, and is a far finer specimen; both seem, however, equally healthy.

In the case of the Cedrus Deodara, whose terminal shoots in young plants frequently fail, owing to the winter and spring frost,

"foreshortening" pruning is very beneficial, promoting the early renewal of the leader where the specimen is healthy and vigorous. It is indeed advantageous to prune the side-shoots of this Cedrus carefully at frequent intervals when young, so as to strengthen the plant and secure an erect habit.

Propagation by cuttings, though less objectionable than grafting, is also to be discouraged, as plants so raised never form such fine trees as those grown from seed. This is unfortunately an almost universal mode of increasing our stock of many of the rarer Conifers, owing to the difficulty in obtaining seeds; and although it cannot be avoided, there is no doubt that only second-class specimens are grown from all young plants reared from any mode of propagation *other* than from the cone; and this is quite apparent when they are compared with the strong-stemmed, majestic, and well-formed seedlings which have been once or twice transplanted. The practice of nursing several of the more rare varieties in *pots* may be also noticed. Many plants are thereby destroyed for future beauty and usefulness, by becoming, either from want of due care or observation, what is technically called "*pot-bound*" in their roots; and when planted out in the situations destined for them, they do not spread out their numerous rootlets and fibres so freely and regularly as seedlings raised in a bed or nursery-ground on the open border in a sheltered situation, and are never so well able to resist the wind when they attain to some height. Instances of this have occurred at Kew Gardens, where many fine old trees have died out or been blown down from this cause. All young pines, whether grown in pots or in the open border, which are intended to be grown as specimens, are very much improved by frequent transplanting. The roots are thereby rendered more fibrous and better calculated to obtain a firm hold of the ground in exposed situations. None of those in our list can be more advantageously treated in this manner than Pinus Macrocarpa, Cephalonica, Excelsa, Lambertiana, and the cypresses generally; and where recourse is had to this treatment, it is a further aid to the growth and development of the young fibrous roots and spongeoles, if good loam and well-made manure mixed together in equal parts be fed into the stools provided for the transplanting operation. The ground should also be well and deeply worked when it is intended to transplant. If so treated in the end of April or beginning of May—the early part of the latter month being, in our opinion, a very safe time to plant out or remove most of the pines—the temperature of the soil is increased by the penetration of the sun's rays, and evaporation caused by the stirring of the damp earth; and the heat so imparted to the soil will greatly assist and promote the development of the rootlets in their new situation, fresh spongeoles being very soon protruded by the plant, as if it had never been removed at all.

Top-dressing with liquid manure (diluted) upon a thin soil, upon the ground *under the extremes of the branches*, will also be found

very beneficial. It should be applied after rain, and will find its way down to the points of the young roots, and stimulate their growth. This should not, however, be practised at such seasons as will induce too early action in the young buds, rendering them liable to be nipped by the frosts of spring; nor should it be attempted in the end of autumn when the natural sap has begun to descend. Cloudy or wet weather in May is the best time for administering such stimulants.

We have noticed in several of our returns complaints against several of the pines mentioned of "gumming;" that is, for throwing out on the stem, chiefly at its juncture with the principal branches, a resinous substance, which, allowed to exude, must naturally weaken the growth and healthy progress of the tree. This evil, to which the Pinus Excelsa seems most liable, arises, we suspect, from the gravelly or dry sandy nature of the subsoil, causing the tree to suffer from dryness at the root. At Rosehall, near Falkirk, one specimen of this pine, after attaining 10 feet in height, became thus affected, and "bled to death." At Keir, likewise, Pinus Excelsa had suffered severely from "gumming." There seems no specific against it except planting such of the varieties as are most subject to its ravages in a good soil with a rather dampish subsoil. Another source of destruction to the coniferous tribe is the attack of insects. The pine-beetle (Hylurgus piniperda) infests the wood of many of the varieties, boring first through the bark, and working perpendicularly upwards, feeding on, and destroying the pith in its course. Pines so affected are easily detected; for their young shoots droop, and become of a sere, yellow colour, and very frequently drop off altogether. The *Adelges*, a scale or cocus insect, is another great enemy to Coniferæ. Its ravages are most injurious to young trees of the Picea order. The Abies Menziesii, Picea Cephalonica, and Pinus Excelsa suffer most from its attacks. It is found on the bark, and it is almost impossible to eradicate it. It appears at first as a white scale-like substance on the stem and branches, and in this state is frequently carried from place to place in the removal of the plant; it afterwards forms cone-like excrescences on the stem and branches, and corrodes the bark in its progress. One species (Adelges laricis) is a sad enemy to the larch family, and other species infest the other pines. There is no effectual plan yet known for its destruction, except the removal of its victims from the pinetum as soon as possible after being discovered.

We may notice as especially worthy of cultivation the following pines, selected from the list more particularly referred to in this Report, as they seem hitherto to have thriven best in the majority of instances since their introduction—Abies Douglassi, Picea Nobilis and Pinsapo, Pinus Laricio, Cupressus Lawsonii, Thujopsis Borealis, Thuja Gigantea, and Wellingtonia Gigantea. The four last named deserve a place in the most prominent part of every collection of ornamental trees.

In addition to those Coniferæ mentioned in the list of the Highland and Agricultural Society of Scotland, there are other varieties well-worthy of notice, and deserving a place in every pinetum.

As many of these have both symmetry and beauty of foliage, as well as hardihood, to recommend them, we append a list of such as appear to be most worthy of extensive cultivation, and which seem best suited to the vicissitudes of soil and exposure in this country. We name them in their order of merit, and as they seem to have thriven best in the majority of instances; and all those specified have been very favourably reported on by many of our correspondents in their returns of the other pines. In several cases the specimens are of considerable size :—

1st, Picea Nordmanniana, which seems almost as hardy as the silver fir, and is well deserving of the most extensive propagation as one of the best pines introduced ; 2d, Pinus Cembra, which, at high elevations—as at Dalwick, Peeblesshire, at an elevation of 800 feet—is as healthy and hardy as the Scots fir; 3d, Pinus Austriaca; 4th, Abies Orientalis, a very fine variety, which is also well worthy of more extensive introduction, and of being much better known than it has as yet been. At Castle Kennedy (Wigtownshire) there is a most magnificent specimen of it 17 feet high. 5th, Abies Canadensis ; 6th, Pinus Maritima; 7th, Pinus Benthamiana; 8th, Pinus Amabilis, which is a lovely pine, and in most places hardy; 9th, Pinus Jeffreyii; 10th, Cryptomeria Japonica ; and 11th, Cupressus Lambertiana. The Cupressus Torulosa has, we fear, proved too often a failure.

Fine collections of most of the above named, and of pines generally, are at Durris, in Kincardineshire (300 feet elevation), which is perhaps the most extensive pinetum in the north, if not in Scotland. It appears also to be well regulated and very thriving. At Cairnsmore, Kirkcudbrightshire (200 feet elevation) ; at Rossdhu, in Dumbartonshire (30 feet elevation) ; at Taymouth Castle, Perthshire (370 feet elevation), where no frost seems ever to affect them, not even that of 1860-61. At Terregles, Kirkcudbrightshire (125 feet elevation) ; at Balgowan and Keillor, Perthshire (200 and 560 feet elevation) ; at Keir, Perthshire (600 feet elevation) ; and at Camperdown, Forfarshire (290 feet elevation).

Amongst the hardiest of all those yet named we may place, as unequalled for that property no less than for its elegance, the Cupressus Lawsonii, than which there is not a finer evergreen in the family of Conifers. It was first introduced, we believe, in 1854, and one of the original plants had, in the end of 1861, attained the height of nearly 10 feet, thus growing even more rapidly than our common larch ; and, like the Wellingtonia Gigantea (whose reputation is now happily pretty well established), the Thujopsis Borealis, and Thuja Gigantea, withstanding the most severe frosts, besides possessing the additional charm of retaining a beautiful evergreen foliage amidst the snows and blasts of winter.

APPENDIX of RETURNS to REPORT on the PROGRESS of CONIFERÆ.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
No. 1.—Bughtrig, Berwickshire. Altitude, 220 feet.						
Araucaria Imbricata	18	14	Loam	Clay	South	Healthy
Cedrus Deodara . .	14	6	do.	do.	do.	do.
„ Atlantica . .	14	7	do.	do.	do.	do.
Abies Douglassi . .	10	6	Light loam	Gravel	Open	do.
„ Menziesii . .	5	2	Loam	Clay	Sheltered	do.
Wellingtonia Gigantea	5	3	do.	do.	South	Very healthy
No. 2.—Wauchope, Parish of Hobkirk, Roxburghshire. Altitude, 600 feet.						
Araucaria Imbricata	5	3½	Loam	Tilly	S.E., but well sheltered by trees.	Thriving
Cedrus Deodara . .	13	11½	do.	do.	do.	Thriving, and very sturdy
„ Atlantica .	11	6	do.	do.	do.	
Abies Menziesii . .	11	14	do.	do.	do.	Do. and growing fast
Picea Nobilis . . .	11	7½	do.	do.	do.	Very thriving; growing 1 foot annually
Pinus Ponderosa. .	11	9½	do.	do.	do.	Very healthy
Wellingtonia Gigantea	5	3	do.	do.	do.	do.
No. 3.—Drumpark, Parish of Irongray, Dumfriesshire and Kirkcudbrightshire. Altitude not ascertained.						
Araucaria Imbricata	5 to 6	3 to 4	Gravelly	Gravelly till	North-east	Healthy; many killed in
Cedrus Deodara . .	5 to 6	3 to 4	do.	do.	do.	do. [1860
„ Atlantica .	5 to 6	4 to 5	do.	do.	do.	Thriving very vigorously
Abies Douglassi . .	10 to 12	14 to 15	do.	do.	do.	Very thriving and orna-
Picea Nobilis . . .	2 to 3	1	do.	do.	do.	Healthy [mental
„ Cephalonica .	4 to 5	4 to 5	do.	do.	do.	do.
„ Pinsapo . .	4 to 5	3 to 4	do.	do.	do.	do. [ous
Cupressus Lawsonii.	2 to 3	1 to 2	do.	do.	do.	Most healthy; very vigor-
Thujopsis Borealis .	2 to 3	1 to 2	do.	do.	do.	do. [well
Thuja Gigantea . .	3 to 4	3 to 4	do.	do.	do.	A strong grower; doing
Wellingtonia Gigantea	3 to 4	5 to 6	Soil & gravel	do.	do.	Vigorous; grew in 1861 2 ft. 10 in.
No. 4.—Cairnsmore, Parish of Minygaff, Kirkcudbrightshire. Altitude, 200 feet.						
Araucaria Imbricata	26	30	Light garden loam	White till	Facing a north wall	Healthy; 4¼ ft. girth at 2 ft. high
Cedrus Deodara . .	22	20	do.	do.	Sheltered	Not thriving
Abies Douglassi . .	10	18	do.	do.	do.	Very thriving, and a rapid grower
Picea Nobilis . . .	8	6	do.	do.	Exposed	Grafted; growing slowly
„ Cephalonica .	8	6	Sandy	Sandy	Sheltered	Very healthy
Pinus Excelsa. . .	10	14	Garden loam	White till	do.	Healthy, and growing rapidly
Cupressus Lawsonii.	5	5	do.	do.	do.	Very thriving, and an excellent *lawn* plant
Wellingtonia Gigantea	6	5	Peat	do.	Open	Very vigorous
No. 5.—Cargen, Parish of Troqueer, Kirkcudbrightshire. Altitude, 80 feet.						
Araucaria Imbricata	6 to 7	6 to 7	Principally loam & clay	Hard till or clay	South & east	Healthy
Cedrus Deodara . .	6 to 7	8 to 9	do.	do.	do.	Quite healthy
Abies Menziesii . .	6 to 7	6 to 7	do.	do.	do.	Have not thriven, but now shooting well
„ Morinda . .	6 to 7	4½	do.	do.	do.	do.
Pinus Laricio . . .	4	2 ft. 4 in.	do.	do.	East	Doing well at 200 feet altitude
„ Excelsa . .	6 to 7	6 to 8	do.	do.	do.	do.
Wellingtonia Gigantea	6 to 7	7	do.	do.	do.	Doing very well

No. 6.—Terregles, Parish of Terregles, Kirkcudbrightshire. Altitude, 125 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	11	14	Sandy loam	Dry sandy, or gravelly	Open	Very thriving
Cedrus Deodara . .	11	21	do.	do.	S. and E.	do.
Abies Douglassi . .	24	41	do.	do.	do.	do.
" Menziesii . .	23	39	do.	do.	do.	do.
Picea Pinsapo . .	12	16	do.	do.	do.	do.
Pinus Excelsa . .	..	16	do.	do.	do.	do.
" Ponderosa .	24	39	do.	do.	do.	do.

No. 7.—Castle Kennedy, Parish of Inch, Wigtownshire. Altitude, 100 feet.

Araucaria Imbricata	19	16	Light loam	Sandy gravel	East	Very healthy
Cedrus Deodara . .	18	24	do.	do.	do.	do.
" Atlantica . .	12	9½	do.	do.	do.	Healthy
Abies Douglassi . .	15	19	do.	do.	do.	do.
" Menziesii . .	18	20	do.	do.	do.	do.
" Morinda . .	14	16	do.	do.	do.	Not robust
Picea Nobilis . . .	17	15½	do.	do.	do.	Healthy
" Cephalonica .	9	10½	do.	do.	do.	Very healthy
" Pinsapo . . .	17	11	do.	do.	do.	do.
Pinus Laricio . . .	15	20	do.	do.	do.	Healthy
" Excelsa . . .	14	13½	do.	do.	do.	Not vigorous
" Lambertiana .	15	10	do.	do.	do.	do.
" Monticola . .	7	4	do.	do.	do.	Healthy
" Macrocarpa .	17	14½	do.	do.	do.	Very straggling
Cupressus Torulosa .	16	9½	do.	do.	do.	Healthy
Thujopsis Borealis .	4	2½	do.	do.	do.	do.
Thuja Variegata . .	4	1½	do.	do.	do.	Not healthy
Wellingtonia Gigantea	7	6	Peat	do.	do.	Healthy

No. 8.—Catrine House, Parish of Sorn, Ayrshire. Altitude, 400 feet.

Cedrus Deodara . .	12	12½	Sandy	Till	Western	Very good
Abies Douglassi . .	3	2	do.	do.	do.	Very healthy
" Morinda . .	3	1	do.	do.	do.	do.
Picea Cephalonica .	3	3	do.	do.	do.	do.
" Pinsapo . .	3	2	do.	do.	do.	do.
Pinus Laricio . . .	3	2	do.	do.	do.	do.
" Excelsa . .	3	2	do.	do.	do.	do.
Wellingtonia Gigantea	3	3	do.	do.	do.	do.

No. 9.—Greenock Cemetery, Parish of West Greenock, Renfrewshire. Altitude, 80 to 300 feet.

Araucaria Imbricata	16	12	2 feet loam	Trap rock	South	Healthy and luxuriant
Cedrus Deodara . .	15	12	do.	do.	do.	do.
" Atlantica . .	14	10	do.	Whinstone	do.	do.
Abies Douglassi . .	18	9	do.	Trap rock	do.	Unhealthy
" Menziesii . .	18	12	do.	Hard whin	do.	Very healthy
" Morinda . .	12	9	do.	Trap rock	do.	Healthy
Picea Nobilis . . .	16	8	do.	Hard rock	do.	do.
" Cephalonica .	16	5	do.	Whin rock	S.W.	do.
" Pinsapo . .	14	3	do.	Trap rock	S.E.	Very healthy
Pinus Laricio . . .	18	8	do.	do.	South	Healthy
" Excelsa . . .	12	10	do.	do.	do.	Very healthy
" Lambertiana . .	10	5	do.	Rocky	do.	Healthy
" Monticola . .	12	7	do.	do.	do.	do.
" Ponderosa . .	15	8	do.	do.	do.	do.
" Macrocarpa .	14	8	do.	Trap rock	do.	do.
Cupressus Torulosa .	10	5	do.	do.	do.	Growing well
" Lawsonii .	8	4	do.	do.	S.E.	Very healthy
Thujopsis Borealis .	8	4	do.	do.	S.W.	do.
Thuja Gigantea . .	9	4	do.	do.	do.	do.
Wellingtonia Gigantea	8	10	do.	Hard rock	South	Very vigorous

No. 10.—Merrylee, Parish of Cathcart, Renfrewshire. Altitude not ascertained.

Araucaria Imbricata	8	5	Loam	Gravelly	Open	Thriving till killed in 1860
Cedrus Deodara . .	Various	2 to 5	Loam & sand	do.	do.	One only thriving
Picea Cephalonica .	4	2	Loam	do.	do.	All killed by frost of 1860-1
Pinus Excelsa . . .	3	2	do.	do.	do.	do.
" Lambertiana .	4	2	do.	do.	do.	do.
" Macrocarpa .	4	2	do.	do.	do.	do.
Cupressus Torulosa .	3	2	do.	do.	do.	do.

No. 11.—Ferguslie House, Parish of Paisley, Renfrewshire. Altitude, 85 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	8	15	Turfy loam	Strong clay	Open	Killed to the ground by frost of 1860
Cedrus Deodara . .	8	7	Peat & loam	do.	do.	Sickly
" Atlantica . .	5	4	do.	do.	do.	Not quite healthy
Abies Douglassi . .	12	10	Good loam	do.	do.	Not yet recovered from injury by frost of 1860
Picea Nobilis . . .	8	6	Good clay	do.	do.	Very healthy
" Pinsapo . . .	6	14	do.	do.	do.	Healthy
Pinus Excelsa . .	8	6	do.	do.	do.	do.
" Lambertiana .	10	8	do.	do.	do.	do.
Cupressus Torulosa .	6	5	Loam & peat	do.	do.	Killed by frost of 1860; healthy till then
" Lawsonii	6	8	do.	do.	do.	Quite hardy
Thuja Gigantea . .	7	11	do.	do.	do.	Very healthy
Wellingtonia Gigantea	5	3½	Good loam	do.	do.	Was injured somewhat by frost of 1860

No. 12.—Milton-Lockhart, Parish of Carluke, Lanarkshire. Altitude, 320 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	9	6	Sandy loam	Clay	South	Not healthy
Cedrus Deodara . .	20	16	do.	do.	do.	Healthy
" Atlantica .	12	10	do.	do.	do.	do.
Picea Cephalonica .	9	6	Loam & peat	Sandy clay	S.W.	Looking well
Pinus Macrocarpa .	7	5	Loam	Clay	South	Quite healthy
Cupressus Torulosa	15	8	Forced heavy loam	Sand	do.	do.

No. 13.—Mauldslie Castle, Parish of Carluke, Lanarkshire. Altitude, 133 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Cedrus Deodara . .	5	4½	Light	Sandy	Westerly	Healthy
Abies Menziesii . .	3	2½	do.	do.	S.W.	do.
Cupressus Lawsonii.	3	3	do.	do.	do.	Quite healthy
Thuja Gigantea . .	3	2½	do.	do.	Westerly	Vigorous

No. 14.—Royal Botanic Gardens, Parish of Govan, Lanarkshire. Altitude, 280 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Abies Douglassi . .	3	2	Turfy loam	Cold till	Sheltered	Good
" Morinda . .	5	5	Stiff retentive	do.	North	Not very healthy
Picea Cephalonica .	7	4	do.	do.	do.	do.
Pinus Laricio . . .	10	15	do.	do.	do.	Very healthy .
" Excelsa . .	8	9	do.	do.	do.	do.
Thuja Gigantea . .	3	1½	Turfy loam	do.	Sheltered	Good
Wellingtonia Gigantea	5	3	Prepared loam	do.	S.E.	Healthy

No. 15.—Darnhall, Parish of Eddlestone, Peeblesshire. Altitude, 800 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	Not known	6	Loam	Gravel	South	Dying
Cedrus Deodara . . .	do.	6	do.	do.	do.	do.
" Atlantica .	do.	5	do.	do.	do.	Growing slowly
Abies Douglassi . .	do.	15	do.	do.	do.	Vigorous
" Menziesii .	do.	16	do.	do.	do.	do.
" Morinda . .	do.	4	do.	do.	do.	Growing slowly
Picea Nobilis . . .	do.	16	do.	do.	do.	Hardy and vigorous
" Cephalonica .	do.	5	do.	do.	do.	Dying
" Pinsapo . . .	do	5	do.	do.	do.	Not very healthy
Pinus Laricio . . .	do	20	do.	do.	do.	Vigorous
" Excelsa . .	do.	5	do.	do.	do.	Dying
" Lambertiana .	do.	6	do.	do.	do.	Growing slowly
" Monticola . .	do.	7	do.	do.	do.	Very healthy
" Ponderosa . .	do.	10	do.	do.	do.	Vigorous
Cupressus Lawsonii	do.	4	do.	do.	do.	do.
Thujopsis Borealis .	do.	4	do.	do.	do.	do.
Thuja Gigantea . .	do.	4	do.	do.	do.	do.
" Variegata . .	do.	3	do.	do.	do.	Dying
Wellingtonia Gigantea	do.	4	do.	do.	do.	Very vigorous

No. 16.—Dalwick, Parish of Drumelzier, Peeblesshire. Altitude, 650 to 900 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	23	18	Light loam	Gravel	North	Sickly, owing to the injury by frost of 1860-61
Cedrus Deodara . .	15	12	do.	do.	do.	Rather sickly
" Atlantica .	7	6	do.	do.	do.	Healthy

No. 16.—DALWICK—*Continued.*

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Abies Douglasii . .	25	36	Light loam	Gravel	East	Healthy
" Menziesii . .	5	5	do.	do.	North	do.
Picea Nobilis . . .	7	5	do.	do.	do.	do.
" Cephalonica .	12	5	do.	do.	do.	Hardy
" Pinsapo . .	3	½	do.	do.	do.	do.
Pinus Laricio . . .	30	40	do.	do.	do.	do.
" Excelsa . .	5	2	do.	do.	do.	Not very healthy
" Lambertiana .	15	12	do.	do.	do.	Healthy
" Ponderosa . .	25	25	do.	do.	do.	do.
Cupressus Torulosa .	3	2	do.	do.	do.	do.
" Lawsonii .	3	2	do.	do.	do.	do.
Thujopsis Borealis .	3	2	do.	do.	do.	do.
Thuja Gigantea . .	5	2½	do.	do.	do.	do.
Wellingtonia Gigantea	5	2	do.	do.	do.	Quite hardy

No. 17.—ROCKVILLE HOUSE, MORNINGSIDE, Parish of St Cuthbert's, Edinburghshire. Altitude, 400 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	7	3	Strong clayey soil	Red clay	South	Healthy, but browned from frost
Cedrus Deodara . .	8	6	do.	do.	do.	do.
" Atlantica .	6	4	do.	do.	North	In pretty good health
Abies Douglasii . .	2	1	do.	do.	South	Healthy
" Menziesii . .	8	5	do.	do.	East	do.
" Morinda . .	9	4	Loam	do.	South	Very unhealthy
Picea Nobilis . . .	10	6	do.	do.	do.	Healthy
" Cephalonica .	2	6	Clayey	do.	North	Not healthy
" Pinsapo . .	10	5	Loam	do.	South	Healthy
Pinus Excelsa . .	10	7	do.	do.	do.	do.
Cupressus Lawsonii .	8	4	do.	do.	East	Very healthy
Thujopsis Borealis .	5	3	do.	do.	North	Not healthy
Thuja Gigantea . .	8	4	do.	do.	East	Very healthy
Wellingtonia Gigantea	5	4	do.	do.	do.	do.

No. 18.—RICCARTON, Parish of Currie, Edinburghshire. Altitude, 300 to 350 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	18	14	Strong loam	Clay & boulders	South	Good and healthy
Cedrus Deodara . .	18	16	do.	do.	do.	Quite healthy
" Atlantica . .	8	5	do.	do.	do.	Healthy
Abies Douglasii . .	18	30	do.	Clay and loam	Sheltered	Very robust
" Menziesii . .	10	10	do.	do.	do.	do.
" Morinda . .	16	12	do.	Clay & boulders	South	Not satisfactory
Picea Nobilis . . .	20	25	do.	do.	do.	Very satisfactory
" Cephalonica .	19	12	do.	do.	Sheltered	Quite healthy
" Pinsapo . .	19	6	do.	do.	do	do.
Pinus Laricio . . .	30	40	do.	do.	All situations	Very satisfactory
" Excelsa . .	18	14	do.	do.	Sheltered	Not doing well
" Lambertiana	12	11	do.	do.	do.	Very good
" Monticola .	6	4	do.	do.	do.	do.
" Ponderosa .	14	10	do.	do.	do.	do.
" Macrocarpa .	14	12	do.	do.	do.	Not satisfactory
Cupressus Lawsonii .	7	5	do.	do.	South	Doing beautifully
Thujopsis Borealis .	8	5	do.	do.	West	In perfect health
Thuja Gigantea . .	7	5	do.	do.	Various	Very healthy
Wellingtonia Gigantea	11	12	do.	do.	South	Both hardy and healthy

No. 19.—WHITEHILL GARDENS, Parish of Carrington, Mid-Lothian. Altitude not ascertained.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	10	6	Light loam	Gravel	South	Unhealthy
Cedrus Deodara . .	10	8	do.	do.	do.	Healthy,
Abies Douglasii . .	7	5	Stiff loam	Clay	North	do.
Picea Nobilis . . .	5	3	do.	do.	South	do.
" Cephalonica .	5	3	do.	do.	do.	Not healthy
" Pinsapo . . .	10	8	do.	do.	do.	Healthy
Pinus Laricio . . .	22	20	Light loam	Gravel	North	do.
" Excelsa . .	7	5	do.	do.	South	do.
" Lambertiana .	6	4	do.	do.	North	Unhealthy.
Thujopsis Borealis .	6	4	Stiff loam	Clay	do.	Healthy.
Thuja Gigantea . .	6	4	do.	do.	do.	do.
Wellingtonia Gigantea	6	6	do.	do.	do.	Very luxuriant.

No. 20.—CARLOWRIE, Parish of Kirkliston, Linlithgowshire. Altitude, 92 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	6	3	Heavy loam	Gravel	Open	Very healthy
Cedrus Deodara . .	5	4	do.	do.	do.	Healthy
" Atlantica . .	16	12½	do.	do.	North	Very hardy
Abies Douglassi . .	5	4½	do.	do.	East	do.
" Menziesii . .	6	4	do.	do.	do.	do.
" Morinda . .	5	2	do.	do.	do.	Good
Picea Nobilis . . .	4	1	do.	do.	do.	do.
" Cephalonica .	5	1	do.	do.	do.	Stunted
" Pinsapo . .	4	2	do.	do.	North	Very healthy
Pinus Laricio . . .	6	3	do.	do.	do.	Very hardy
" Excelsa . .	3	1	do.	do.	East	Good
" Lambertiana .	5	1½	do.	do.	do.	Healthy
Cupressus Lawsonii	5	3½	do.	do.	South	Very hardy
Thujopsis Borealis .	5	3	do.	do.	North	do.
Thuja Gigantea . .	5	2½	do.	do.	East	do.
Wellingtonia Gigantea	7	8	do.	do.	South	do.

No. 21.—LINLITHGOW PALACE, Parish of Linlithgow, Linlithgowshire. Altitude, 180 feet.

Cedrus Deodara . .	5 to 10	3 to 9	Prepared soil	Sand & gravel	Open	Doing very well
Abies Morinda . .	9 to 10	3 to 4	do.	do.	do.	Not thriving
Picea Pinsapo . .	8	1½	Sandy loam	do.	do.	Good
Pinus Laricio . . .	4	2	do.	do.	do.	Thriving
" Excelsa . .	8	4½	do.	do.	do.	Not quite hardy
" Ponderosa .	6	2½	do.	do.	do.	Quite hardy

No. 22.—DALMENY PARK, Parish of Dalmeny, Linlithgowshire. Altitude, 80 feet.

Araucaria Imbricata	10	7	Stiff clay	Wet clay	Sheltered	Unhealthy
Cedrus Deodara . .	6	6	Good loam	Light soil	Open	Healthy
" Atlantica .	13	9	Light loam	Tilly	Shaded by trees	Not quite healthy
Abies Douglassi . .	8	6	do.	do.	do.	Healthy

No. 23.—HOPETOUN, Parish of Abercorn, Linlithgowshire. Altitude, 80 feet.

Araucaria Imbricata	16	14	Light loam	Sand	South	Healthy
Cedrus Deodora . .	30	30	do.	Gravel	North	do.
Abies Douglassi . .	35	55	do.	do.	do.	do.
" Morinda . .	44	46	do.	do.	do.	do.
Picea Nobilis . . .	7	3	do.	Sand	South	do.
" Cephalonica .	18	9	do.	Gravel	North	do.
Pinus Laricio . . .	44	48	do.	do.	do.	do.
" Excelsa . .	18	17	do.	do.	do.	do.
Wellingtonia Gigantea	7	6	Mossy	Clay	do.	do.

No. 24.—ROCKVILLE, Parish of Linlithgow, Linlithgowshire. Altitude, 230 to 280 feet.

Araucaria Imbricata	Various ages, from 3 to 7 years	9	Loam & clay	Rock	Northerly	Healthy
Cedrus Deodara . .		10½	Garden soil	Various	Various	Good
" Atlantica . .		9	Loam	Rock	Northerly	do.
Abies Douglassi . .		8½	Garden soil	Clay	do.	Very healthy
" Menziesii . .		5	Loam	Rock	do.	Doing well
" Morinda . .		9	do.	do.	do.	Not thriving
Picea Nobilis . . .		2	do.	Clay	do.	do.
" Cephalonica .		4½	do.	do.	do.	Tolerable
" Pinsapo . .		4½	do.	do.	do.	Good
Pinus Laricio . . .		8	Various	Various	do.	do.
" Excelsa . .		11	do.	do.	do.	Very good
" Monticola . .		1	Loam	Clay	do.	Healthy
" Ponderosa .		4½	Various	Various	do.	do.
" Macrocarpa .		9½	Loam	Gravel	do.	do.
Cupressus Lawsonii		4½	Garden soil	Clay	do.	Very healthy
Thujopsis Borealis .		8½	do.	do.	do.	do.
Thuja Gigantea . .		7	do.	do.	do.	Very hardy
" Variegata . .		5	do.	do.	do.	Healthy
Wellingtonia Gigantea		12	do.	do.	do.	Very hardy

No. 25.—KINNEIL, Parish of Bo'ness, Linlithgowshire. Altitude, about 80 feet.

Araucaria Imbricata	11	6	Hazel loam	Clay	S.W.	Not quite healthy
Cedrus Deodara . .	8	5	do.	do.	West	Healthy
" Atlantica .	10	3	do.	do.	do.	do.
Picea Nobilis . . .	9	7	Light	Gravel	do.	Very healthy

No. 25.—KINNEIL—*Continued.*

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Picea Pinsapo . .	7	3	Light	Gravel	½ West	Healthy
Pinus Macrocarpa .	7	5	do.	do.	South	do.
Thuja Gigantea . .	6	5	do.	do.	do.	do.
Wellingtonia Gigantea	3	2½	do.	do.	do.	Very healthy

No. 26.—NEWLISTON, Parish of Kirkliston, Linlithgowshire. Altitude, 165 feet.

Araucaria Imbricata	6	5	Loamy	Clayey	S.W.	Healthy
Cedrus Deodara . .	23	20	do.	do.	Sheltered	Very sickly
Abies Douglassi . .	3	2½	do.	do.	do.	Healthy
" Morinda . .	15	10	Stiff loam	Clay	S.W.	Rather sickly
Pinus Excelsa . .	5	8	Loamy	do.	Sheltered	Very healthy
" Ponderosa .	4	2½	Strong loam	do.	do.	do.
Wellingtonia Gigantea	5	3½	do.	do.	do.	Quite healthy

No. 27.—WALLHOUSE, Parish of Torphichen, Linlithgowshire. Altitude, 620 feet.

Araucaria Imbricata	5	3	Sandy loam	Rotten rock	N.W.	Not very healthy
Cedrus Deodara . .	6	4	do.	do.	do.	Very sickly
" Atlantica . .	8	4	do.	do.	do.	Nearly dead
Abies Douglassi . .	5	4	do.	Clay	S.W.	do.
" Menziesii . .	4	2	Deep loam	Rotten rock	do.	Quite healthy
Pinus Excelsa . .	5	3	Heavy loam	do.	West	Very healthy
Thuja Variegata . .	3	1	Light sandy	do.	S.W.	Healthy
Wellingtonia Gigantea	6	4	Clayey	Clay	East	Very vigorous

No. 28.—DUNMORE, Parish of Airth, Stirlingshire. Altitude, 40 feet.

Araucaria Imbricata	10	12	Strong clay and sand	Blue clay	North	Very vigorous
Cedrus Deodara . .	12	10	do.	do.	do.	do.
" Atlantica .	7	5	Sandy	Sand	Sheltered	Healthy
Abies Douglassi . .	5	3	do.	Clay and sand	do.	do.
Picea Nobilis . . .	10	14	do.	Gravelly	do.	Very strong
Pinus Laricio . . .	8	5	do.	do.	do.	do.
" Lambertiana .	3	5	do.	do.	do.	do.
" Monticola . .	3	5	do.	do.	do.	do.
" Macrocarpa .	5	7	do.	do.	Open	Very hardy and strong
Wellingtonia Gigantea	5	8	do.	do.	do.	Very vigorous

No. 29.—ROSEHALL, Parish of Falkirk, Stirlingshire. Altitude, 160 feet.

Cedrus Deodara . .	14	11	Deep loam	Sand	South	Healthy
" Atlantica .	10	6	do.	do.	do.	do.
Abies Douglassi . .	10	10	do.	do.	do.	Moderately healthy
" Menziesii . .	10	8	do.	do.	do.	Healthy
Picea Nobilis . . .	10	5	do.	do.	do.	Very healthy
" Pinsapo . .	10	5	do.	do.	do.	Good and healthy
Pinus Laricio . . .	10	10	do.	do.	do.	Healthy and hardy
" Excelsa . .	10	11	do.	do.	do.	Very handsome
" Lambertiana .	8	6	do.	do.	do.	Healthy
" Monticola . .	9	7	do.	do.	do.	Succeeding well
Cupressus Lawsonii .	8	5	do.	do	do.	Most healthy
Thujopsis Borealis .	8	5	do.	do.	do.	Very healthy
Thuja Gigantea . .	10	5	do.	do.	do.	Most healthy
" Variegata . .	6	2	do.	do.	do.	Healthy
Wellingtonia Gigantea	10	13	do.	do.	do.	Healthy

No. 30.—ALVA HOUSE, Parish of Alva, Stirlingshire. Altitude, 300 feet.

Araucaria Imbricata	16	10½	Light loam	Gravel	South	Luxuriant
Cedrus Deodara . .	17	20	do.	do.	do.	do.
" Atlantica .	18	17	do.	do.	do.	do.
Abies Douglassi . .	15	12	do.	do.	do.	do.
Pinus Excelsa . .	16	9	do.	Sandy loam	do.	do.
" Macrocarpa .	14	10	do.	do.	do.	Very healthy
Cupressus Torulosa .	17	17	do.	do.	do.	do.
" Lawsonii	18	16	do.	do.	do.	do.

No. 31.—ROSSDHU, Parish of Luss, Dumbartonshire. Altitude, 30 feet.

Araucaria Imbricata	16	15	Sandy loam	Gravelly	N. & S.	In vigorous health
Cedrus Deodora . .	16	27	do.	do.	do.	Healthy
" Atlantica . .	6	8	do.	do.	do.	do.

No. 31.—Rossdhu—*Continued.*

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Abies Douglassi . .	24	54	Sandy loam	Gravelly	N. & S.	Vigorous
" Menziesii . .	24	82	do.	do.	do.	Healthy
" Morinda . .	4	2½	do.	do.	do.	do.
Picea Nobilis . . .	3	2⅙	do.	do.	do.	do.
" Cephalonica .	16	12	do.	do.	do.	do.
" Pinsapo . .	16	9½	do.	do.	do.	do.
Pinus Laricio . . .	24	33	do.	do.	do.	do.
" Excelsa . . .	16	24	do.	do.	do.	do.
" Lambertiana .	15	22	do.	do.	do.	do.
" Ponderosa . .	12	12	do.	do.	do.	do.
Cupressus Lawsonii .	6	6	do.	do.	do.	Vigorous
Thujopsis Borealis .	4	3	do.	do.	do.	Healthy
Wellingtonia Gigantea	6	6	do.	do.	South	do.

No. 32.—Balloch Castle, Parish of Bonhill, Dumbartonshire. Altitude, about 150 feet.

Araucaria Imbricata	22	21	Loam	Rock	West	Healthy
Cedrus Deodara . .	22	14	do.	do.	S.W.	do.
Abies Douglassi . .	22	31	do.	do.	do.	do.
" Morinda . .	20	11½	do.	do.	do.	Not quite healthy
Picea Nobilis . . .	6	8½	do.	do.	West	Vigorous
" Cephalonica .	20	7½	do.	do.	S.W.	Healthy
" Pinsapo . .	22	13	do.	do.	West	do.
Pinus Excelsa . . .	22	19½	Peaty loam	do.	do.	do.
" Lambertiana .	20	11½	do.	do.	S.W.	do.
Cupressus Lawsonii	3	1½	Loam	do.	West	Good
Wellingtonia Gigantea	6	7	do.	do.	S.W.	Very healthy

No. 33.—Cambus Cottage, Parish of Alloa, Clackmannanshire. Altitude, 50 feet.

Araucaria Imbricata	14	9	Prepared	Clay	South	Quite hardy
Cedrus Deodara . .	14	17	do.	do.	East	do.
" Atlantica .	6	4	do.	do.	South	do.
Abies Douglassi . .	12	8	do.	do.	do.	do.
" Morinda . .	6	4	do.	do.	do.	Rather stunted
Pinus Excelsa . .	6	5	do.	do.	S.W.	Very vigorous
Thuja Gigantea . .	16	15	do.	do.	East	Very hardy
Wellingtonia Gigantea	8	2	do.	do.	do.	Very healthy

No. 34.—Tillicoultry House, Parish of Dollar and Tillicoultry, Clackmannanshire. Altitude, 174 feet.

Araucaria Imbricata	10	5	Loam & gravel	Sandy clay	South	Healthy
Cedrus Deodara . .	14	12	do.	do.	do.	Luxuriant
" Atlantica .	6	3	do.	do.	do.	Healthy
Abies Douglassi . .	8	6	do.	do.	do.	Luxuriant
Pinus Laricio . . .	14	6	do.	do.	do.	Healthy
" Excelsa . . .	14	8	do.	do.	do.	do.
" Lambertiana .	6	3	do.	do.	do.	do.
Wellingtonia Gigantea	6	4	do.	do.	do.	Quite healthy

No. 35.—Green, Parish of Kinross, Kinross-shire. Altitude, 300 feet.

Araucaria Imbricata	6	3	Gravelly	Gravel	Open	Not very thriving
Cedrus Deodara . .	8	4	do.	do.	do.	Sickly
" Atlantica .	4	2	do.	do.	do.	Healthy
Abies Douglassi . .	10	6	do.	do.	do.	Very sickly
" Morinda . .	8	3	do.	do.	do.	Lost leader
Picea Nobilis . . .	3	1	do.	do.	do.	Healthy
" Cephalonica .	3	1	do.	do.	do.	Lost its leader
" Pinsapo . .	6	4	do.	do.	do.	Very healthy
Pinus Excelsa . .	8	6	do.	do.	do.	Very sickly
Cupressus Torulosa .	8	2	do.	do.	do.	Almost dead
" Lawsonii	2	1	do.	do.	do.	Healthy
Thujopsis Borealis .	2	1	do.	do.	do.	do.
Wellingtonia Gigantea	6	8	do.	do.	do.	Quite hardy

No. 36.—Fordell, Parish of Inverkeithing, Fifeshire. Altitude, 260 feet.

Araucaria Imbricata	9	8	Medium loam	Whin rock	South	Healthy
Cedrus Deodara . .	12	15	Deep loam	Gravel	do.	Growing fast
" Atlantica .	8	8	Medium loam	Gravelly clay	N.E.	Healthy
Abies Douglassi . .	12	18	Deep loam	Stony & gravel	South	do.

No. 36.—Fordell—*Continued.*

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Abies Menziesii . .	6	7	Very wet loam	Peat	South	Healthy
" Morinda . .	5	5	Loam	Gravel	East	do.
Picea Nobilis . . .	6	8	Deep loam	Whin rock	South	do.
" Cephalonica .	8	8	do.	Clay	East	do.
" Pinsapo . .	2	1½	do.	Gravelly	do.	do.
Pinus Excelsa . . .	10	10	Stiff loam	Clay	South	do.
" Lambertiana .	6	8	Loam	Gravelly	do.	Killed in 1860-61
" Monticola . .	4	5	do.	do.	North	Healthy
" Ponderosa . .	4	3	do.	do.	South	do.
" Macrocarpa .	6	8	do.	do.	North	Killed in 1860-61
Cupressus Torulosa .	8	5	do.	do.	South	do.
" Lawsonii	3	2½	do.	do.	do.	Quite healthy
Thujopsis Borealis .	4	3½	do.	do.	do.	do.
Thuja Gigantea . .	8	4½	do.	do.	North	do.
Wellingtonia Gigantea	7	11	Deep loam	do.	South	do.
No. 37.—Leslie House, Parish of Leslie, Fifeshire. Altitude, 300 feet.						
Araucaria Imbricata	7	4	Sandy loam	Gravel	East	Vigorous
Cedrus Deodara . .	13	8	do.	do.	do.	Quite healthy
Pinus Ponderosa .	6	2	do.	do.	Western	Healthy
Cupressus Torulosa .	6	3	do.	do.	do.	Vigorous
" Lawsonii	6	5	do.	do.	do.	do.
Thuja Gigantea . .	7	5	do.	do.	do.	do.
Wellingtonia Gigantea	4	3	do.	do.	Northern	Quite hardy
No. 38.—Dysart Gardens, Parish of Dysart, Fifeshire. Altitude, 45 feet.						
Araucaria Imbricata	30	29	Light	Sand	S.E.	Quite hardy
Cedrus Deodara . .	30	31	do.	do.	N. & S.	do.
" Atlantica .	25	10	do.	Sandy clay	S.E.	do.
Abies Douglassi . .	30	33	do.	do.	do.	do.
" Morinda . .	8	10	do.	do.	S.E. & W.	do.
Picea Cephalonica .	6	3	do.	Sand	do.	Not healthy
" Pinsapo . .	6	2	do.	do.	do.	do.
Pinus Laricio . . .	40 to 60	40 to 65	do.	Sandy clay	N.W. & S.	Quite healthy
" Excelsa . .	12	19	do.	Sand	N. & S.	do.
" Monticola . .	25	23	do.	do.	do.	do.
Cupressus Torulosa .	12	11	do.	Clay	N.E. & S.	do.
" Lawsonii .	4	2	do.	do.	do.	do.
Thujopsis Borealis .	4	2	do.	Clay and sand	do.	do.
Wellingtonia Gigantea	5	8	do.	Sand	S.E. & W.	do.
No. 39.—Inzievar, Parish of Torryburn, Fifeshire. Altitude, about 200 feet.						
Araucaria Imbricata	10	21	Clay	Stiff clay	South	Doing very well
Cedrus Deodara . .	10	8	do.	do.	do.	do.
" Atlantica .	10	8	do.	do.	do.	do.
Abies Douglassi . .	8	8	do.	do.	do.	do.
" Menziesii . .	10	7	do.	do.	do.	do.
Picea Cephalonica .	8	5	do.	do.	do.	Thriving well.
" Pinsapo . .	10	12	do.	do.	do.	do.
Wellingtonia Gigantea	4	1½	do.	do.	do.	Very vigorous.
No. 40.—Camperdown, Parish of Liff and Benvie, Forfarshire. Altitude 290 feet.						
Araucaria Imbricata	18	22	Gravelly loam	Stiff clay	Southern	Healthy
Cedrus Deodara . .	19	25	do.	do.	do.	do.
Abies Douglassi . .	19	33	do.	do	do.	do.
" Morinda	18	16	do.	do.	do.	Not very healthy
Picea Nobilis . . .	18	20	do.	do.	do.	Quite healthy
" Cephalonica .	20	16	do.	do.	do.	do.
Pinus Excelsa . .	20	18	do.	do.	do.	Quite hardy
" Lambertiana	18	22	do.	do.	do.	Sickly
" Ponderosa .	24	25	Black loam	Deep loam	do.	Healthy
Cupressus Lawsonii .	5	6	do	do.	do.	Very vigorous
Thujopsis Borealis .	6	4	do.	do.	do.	Very healthy
Wellingtonia Gigantea	9	8	Gravelly	do	Open	do.
No. 41.—Tulliallan Castle, Parish of Tulliallan, Perthshire. Altitude, 50 feet.						
Araucaria Imbricata	14	10	Light darkish loam	Clay & gravel	South	Thriving well
Cedrus Deodara . .	20	23	do.	do.	West	Very healthy

No. 41.—TULLIALLAN CASTLE—*Continued.*

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Abies Menziesii . .	7	5	Light dark-ish loam	Clay & gravel	West	Not very thriving
" Morinda . .	6	4	do.	do.	do.	do.
Picea Nobilis . . .	6	4	do.	do.	do.	do.
" Cephalonica .	7	5	do.	do.	do.	do.
" Pinsapo . .	6	4	do.	do.	do.	Healthy
Pinus Laricio . . .	18	20	do.	do.	do.	Thriving
" Excelsa . .	4	6	do.	do.	do.	Healthy
" Lambertiana	6	3	do.	do.	do.	do.
Wellingtonia Gigantea	5	4	do.	do.	do.	Very Vigorous.

No. 42.—KEIR, Parish of Lecropt, Perthshire. Altitude, 600 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	27	26	Deep loam	Sandy rock	N.W.	Very healthy
Cedrus Deodara . .	15	14	Sandy loam	Loose rock	S.E.	do.
" Atlantica . .	10	8	do.	Sand and red oxide	S.W.	Not luxuriant
Abies Douglassi . .	25	30	do.	Clay with oxide	South	Very luxuriant
" Menziesii . .	15	14	do.	Do. oxide of iron	do.	Healthy
" Morinda . .	15	13	do.	do.	do.	do.
Picea Nobilis	17	13	Vegetable soil	do.	do.	Very luxuriant
" Pinsapo . . .	15	9	Sandy loam	Sandy rocky	do.	Healthy
Pinus Laricio . . .	15	15	do.	Sandy clay	do.	do.
" Excelsa . .	15	15	do.	do.	do.	do.
" Monticola . .	15	17	do.	do.	do.	Luxuriant
" Ponderosa .	15	9	do.	do.	do.	Not quite healthy
" Macrocarpa .	15	17	Deep loam	do.	do.	Luxuriant
Cupressus Torulosa .	15	15	Sandy loam	do.	S.E.	Healthy
" Lawsonii .	5	2	do.	do.	do.	do.
Thujopsis Borealis .	5	3	do.	do.	do.	do.
Thuja Gigantea . .	5	4	do.	do.	do.	do.
Wellingtonia Gigantea	5	4	do.	do.	do.	Very healthy

No. 43.—TAYMOUTH, Parish of Kenmore, Perthshire. Altitude, 370.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	17	20	Light loam	Gravelly	South	Very robust and healthy
Cedrus Deodara . .	23	22	do.	do.	do.	Healthy
" Atlantica	12	7	do.	do.	do.	do.
Abies Douglassi . .	23	58	do.	Pure gravel	do.	Exceedingly healthy
" Morinda . .	20	16	Light sandy	Damp & stony	Open	Very hardy
Picea Nobilis . . .	12	15	Light loam	Gravelly	South	Vigorous
" Cephalonica .	14	18	do.	do.	Shaded	Most healthy
" Pinsapo . .	12	5	do.	Damp & stony	West	do.
Pinus Laricio . . .	20	30	do.	Sandy	South	do.
" Excelsa . .	21	17	do.	do.	do.	do.
" Lambertiana .	20	13	do.	do.	do.	do.
" Monticola . .	7	3	Sandy	Stony	West	Healthy
" Ponderosa .	14	10	do.	do.	South	Very robust
" Macrocarpa .	7	10	Light loam	Gravelly	do.	do.
Cupressus Torulosa	10	5	do.	Rocky	do.	Rather tender
" Lawsonii	7	3	do.	do.	do.	Healthy
Thujopsis Borealis .	8	4	do.	Sandy	do.	Very hardy
Thuja Gigantea . .	10	7	do.	Rocky	do.	Very vigorous
Wellingtonia Gigantea	10	8	do.	Gravel	do.	do.

No. 44.—FINGASK CASTLE, Parish of Kilspindie, Perthshire. Altitude, 150 to 250 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	28	23	Rich loam	Rotten rock & whinstone	S. & S.E.	Healthy
Cedrus Deodara . .	18	30	do.	Rock	do.	do.
Abies Douglassi . .	20	23	Black loam	Clay & gravel	South	Very healthy
" Menziesii . .	18	43	do.	do.	S. & W.	do.
" Morinda . .	8	7	Rich soil	Till	South	Healthy
Picea Cephalonica .	18	28	Rich loam	Whinstone	do.	do.
" Pinsapo . .	18	16	do.	Gravel	do.	do.
Pinus Excelsa . .	18	22	Black loam	Till	do.	do.
Cupressus Torulosa .	10	12	Various	Various	Various	do.
" Lawsonii	9	16	Garden soil	do.	South	Healthy and beautiful
Wellingtonia Gigantea	4	7	Brown loam	Gravelly till	do.	Very hardy

No. 45.—PITFOUR, Parish of St Madoes, Perthshire. Altitude, 75 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	17	11	Stiff loam	Clay	South	Healthy
Cedrus Deodara . .	28	24	Loam	do.	do.	do.
Abies Douglassi . .	14	13	Sandy loam	Sand	N.E.	Very healthy
" Menziesii . .	14	24	do.	do.	East	do.

No. 45.—PITFOUR—*Continued.*

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Abies Morinda . .	14	9	Sandy loam	Sand	East	Very healthy
Picea Nobilis . . .	8	1	do.	do.	do.	Not thriving
" Cephalonica .	14	17	do.	do.	do.	Very healthy
" Pinsapo . .	14	12	do.	do.	do.	do.
Pinus Laricio . . .	14	17	do.	do.	do.	do.
" Excelsa . .	10	6	do.	do.	N.E.	do.
" Ponderosa .	14	10	do.	do.	East	Not quite healthy
Cupressus Torulosa .	10	11	Clay	Stiff clay	Sheltered	Killed by frost of 1860-61

No. 46.—ST MADOES MANSE, Parish of St Madoes, Perthshire. Altitude, 75 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Cedrus Deodara . .	12	17	Light sandy	Sand and clay	S.W.	Very healthy
Abies Douglassi . .	4	5	do.	do.	S. & E.	do.

No. 47.—MURTHLY CASTLE, Perthshire. Altitude, about 150 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	All planted here within 20 years	20	Light	Gravelly and sandy	Open	Most healthy.
Cedrus Deodara . .		36	do.	do.	do.	do.
" Atlantica . .		10	do.	do.	do.	do.
Abies Douglassi . .		50	do.	do.	do.	do.
" Menziesii . .		40	do.	do.	do.	do.
" Morinda . .		10	do.	do.	do.	do.
Picea Nobilis . . .		7	do.	do.	do.	do.
" Cephalonica .		20	do.	do.	do.	do.
" Pinsapo. . .		12	do.	do.	do.	do.
Pinus Excelsa . .		20	do.	do.	do.	do.
" Lambertiana .		9	do.	do.	do.	do.
" Monticola . .		30	do.	do.	do.	do.
" Macrocarpa .		6	do.	do.	do.	do.
Cupressus Lawsonii .		8	do.	do.	do.	do.
Thujopsis Borealis .		6	do.	do.	do.	do.
Thuja Gigantea . .		7	do.	do.	do.	do.
Wellingtonia Gigantea		13	Peat soil	do.	do.	do.

No. 48.—CLATHICK, Parish of Monzievaird, Perthshire. Altitude not ascertained.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	12	5	Light	Gravelly	Open.	Healthy
Cedrus Deodara . .	20	12	do.	do.	do.	do.
Picea Cephalonica .	4	1	Rich loam	Clay	do.	do.
" Pinsapo . .	4	1	do.	do.	do.	do.
Cupressus Lawsonii .	5	2	do.	do.	do.	do.
Wellingtonia Gigantea	6	3	do.	do.	do.	Very healthy

No. 49.—DINIMARLE, Parish of Culross, Perthshire. Altitude, a few feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	14	5	Black loam	Coarse gravel	Southern	Rather stunted
Cedrus Deodara . .	30	20	do.	do.	do.	Very healthy
Abies Morinda . .	24	18	do.	do.	do.	Healthy
Pinus Excelsa . .	24	18	do.	Wet clay	do.	Very healthy

No. 50.—MEGGINCH CASTLE, Parish of Errol, Perthshire. Altitude, 80 to 100 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	6 to 9	9 to 10½	Heavy loam	Till & gravel	Sheltered, but open	Very healthy
Cedrus Deodara . .	17	21	do.	do.	do.	do.
" Atlantica .	10	8	do.	do.	do.	do.
Abies Douglassi . .	4 to 14	6 to 20	do.	Clay and till	do.	do.
" Menziesii . .	..	Small	do.	Gravel and till	do.	do.
" Morinda . .	13	6	do.	do.	do.	Healthy
Picea Nobilis . . .	..	Small	do.	do.	do.	do.
" Cephalonica .	19	13	do.	do.	do.	do.
Pinus Laricio . . .	..	15	Sandy clay	Clay	do.	do.
Cupressus Torulosa .	..	10	Heavy loam	Till and gravel	do.	do.
Wellingtonia Gigantea	5	7	do.	do.	do.	Very healthy.

No. 51.—BALGOWAN, Parish of Methven, Perthshire. Altitude, 200 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Cedrus Deodara . .	8	15	Loam	Old red sandstone	South	Vigorous.
" Atlantica .	5	7	do.	do.	West	do.
Abies Morinda . .	5	5	do.	do.	Sheltered	Good
Picea Cephalonica .	Small	Small	do.	do.	do.	Healthy
" Pinsapo . .	do.	do.	do.	do.	do.	do.
Pinus Excelsa . .	do.	do.	do.	do.	do.	Unhealthy

No. 51.—Balgowan—*continued.*

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Cupressus Lawsonii.	5	4½	Loam	Red freestone	South	Vigorous
Thujopsis Borealis .	5	5	do.	do.	do.	do.
Thuja Gigantea . .	5	4½	do.	do.	do.	Very healthy
Wellingtonia Gigantea	5	8	do.	do.	West	do,
No. 52.—Keillor, Parish of Fowlis-Wester, Perthshire. Altitude, 560 feet.						
Araucaria Imbricata	18	13	Boggy moor	Stony clay	South	Vigorous
Abies Douglassi . .	29	42	do.	do.	do.	do.
" Menziesii . .	29	37	do.	do.	do.	do.
Picea Nobilis . . .	18	31	do.	do.	do.	Very healthy
Pinus Laricio . . .	28	27½	do.	do.	do.	do.
" Lambertiana .	18	13	do.	do.	do.	Healthy
" Monticola . .	29	39	do.	do.	do.	Very healthy
" Ponderosa .	28	27½	do.	do.	do.	Healthy
No. 53.—Stonefield (Lochfineside), Parish of Knapdale, Argyleshire. Altitude, 30 to 200 feet, and none of the Pines more than 200 yards from the sea.						
Araucaria Imbricata	14	10	Brown loam	Rock	S.E.	Very healthy
Cedrus Deodara . .	19	22	do.	Moss	do.	do.
" Atlantica .	8	7	do.	do.	N.E.	do.
Abies Douglassi . .	9	13	do.	Rock	do.	do.
" Menziesii . .	12	10	do.	do.	South	do.
" Morinda . .	12	8	do.	do.	S.E.	do.
Picea Nobilis . . .	7	4	do.	do.	South	do.
" Cephalonica .	7	4	do.	do.	East	do.
" Pinsapo . .	5	2	do.	do.	South	do.
Pinus Laricio . . .	17	29	do.	do.	do.	do.
" Excelsa . .	17	19	do.	do.	do.	do.
" Lambertiana .	5	2	do.	do.	N.E.	do.
" Monticola . .	5	2	do.	do.	do.	do.
" Ponderosa . .	6	3	do.	do.	S.E.	do.
" Macrocarpa .	4	1½	do.	do.	South	do.
Cupressus Torulosa .	5	4	do.	do.	do.	do.
" Lawsonii	6	4	do.	do.	S.E.	do.
Thujopsis Borealis .	6	4	do.	do.	N.E.	do.
Thuja Gigantea . .	5	3	do.	Moss	do.	do.
Wellingtonia Gigantea	6	5	Black loam	do.	East	do.
No. 54.—Ardchattan Priory, Parish of Ardchattan, Argyleshire. Altitude, 10 feet.						
Araucaria Imbricata	9	11	Light sandy	Sand & gravel	South	Very luxuriant
Cedrus Deodara . .	15	12	do.	do.	do.	Quite healthy
Wellingtonia Gigantea	4	3	do.	do.	do.	Very vigorous
No. 55.—Kilmory (Lochgilphead), Parish of Kilmichael Glassary, Argyleshire. Altitude, 100 feet.						
Araucaria Imbricata	16	7	Medium loam	Dry	West	Very healthy
Cedrus Deodara . .	16	15	do.	do.	do.	do.
" Atlantica . .	25	30	do.	do.	do.	do.
Abies Douglassi . .	6	6	do.	do.	do.	do,
Picea Pinsapo . . .	16	7	do.	Rocky	do.	Not quite healthy
Pinus Excelsa . .	16	17	do.	Clay	do.	Very healthy
Cupressus Torulosa .	16	9	do.	do.	do.	do.
Wellingtonia Gigantea	6	2½	do.	do.	do.	Very vigorous plants
No. 56.—New Inveraw, Parish of Inishael, Argyleshire. Altitude not ascertained.						
Araucaria Imbricata	18	4½	Light	Tilly clay	Sheltered	Healthy
	15	5¼	do.	do.	do.	Very strong
Cedrus Deodara . .	15	20	Medium	Till and moss	South	Very healthy
Abies Douglassi . .	12	25	do.	Tilly clay	North	Very flourishing
Picea Cephalonica .	18	12	Poor soil	Till	S.E.	Very bushy
" Pinsapo . .	18	10	do.	do.	do.	do.
Wellingtonia Gigantea	3	1½	Moss & gravel	do.	N.W.	Very flourishing
No. 57.—Durris, Parish of Durris, Kincardineshire. Altitude, 300 feet.						
Araucaria Imbricata	8	10	Light loam	Loose gravelly clay	North	Thriving
Cedrus Deodara . .	8	9	do.	do.	Open	Good; a slow grower
" Atlantica .	6	6	do.	do,	North	Healthy

No. 57.—Durris—*Continued.*

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Abies Douglassi . .	22	50	Light loam	Loose gravelly clay	North	Fast growing
" Menziesii . .	6	6	do.	do.	South	Thriving
" Morinda . .	6	5	do.	do.	North	do.
Picea Nobilis . . .	22	36	do.	do.	South	do.
" Cephalonica .	6	5	do.	do.	do.	do.
" Pinsapo . . .	6	5	do.	do.	do.	do.
Pinus Laricio . . .	20	25	do.	do.	Various	do.
" Excelsa . . .	6	8	do.	do.	North	do.
" Lambertiana .	5	6½	do.	do.	South	do.
" Monticola . .	4	2	do.	do.	do.	do.
" Ponderosa . .	5	6	do.	do.	do.	do.
Cupressus Lawsonii .	3	4	do.	do.	North	do.
Thujopsis Borealis .	3	4	do.	do.	do.	do.
Thuja Gigantea . .	3	4½	do.	do.	do.	do.
Wellingtonia Gigantea	4	6½	do.	do.	do.	do.

No. 58.—Newton, Parish of Culsalmond, Aberdeenshire. Altitude, about 350 feet.

Araucaria Imbricata	8 to 10	5 to 6	Loamy, good clay	Clay	S.E.	Healthy
Cedrus Deodara . .	15	9	do.	do.	do.	do.
" Atlantica .	7	5	do.	do.	do.	Very healthy
Abies Douglassi . .	14	16	do.	do.	do.	Very vigorous
" Menziesii . .	14	3	do.	do.	do.	Not thriving
" Morinda . .	7	5	do.	do.	do.	Healthy
Picea Pinsapo . . .	4	3	do.	do.	do.	do.
Pinus Laricio . . .	14	18	do.	do.	do.	Vigorous and healthy
" Excelsa . .	14	8	do.	do.	do.	Not healthy
" Ponderosa .	6	5	do.	do.	do.	Healthy
Thuja Gigantea . .	3	2	do.	do.	do.	Very hardy
Wellingtonia Gigantea	5	4	do.	do.	do.	Very healthy & vigorous

No. 59.—Balmoral Castle, Parish of Crathie, Aberdeenshire. Altitude, 870 feet.

Cedrus Deodara . .	10	4	Light	Gravel	North	Healthy
" Atlantica .	4	1	do.	do.	do.	do.
Abies Douglassi . .	8	5	do.	do.	do.	do.
" Morinda . .	7	3	do.	do.	do.	Rather stunted
Picea Nobilis . . .	6	1	do.	do.	do.	Healthy
Pinus Laricio . . .	10	6	do.	do.	do.	do.
" Excelsa . .	6	1	do.	do.	do.	Not thriving well
" Ponderosa .	5	1	do.	do.	do.	Thriving well
Wellingtonia Gigantea	8	4	Peat and light soil	do.	do.	Very vigorous

No. 60.—Ballindalloch, Parish of Inveraven, Morayshire and Banffshire. Altitude, 470 feet.

Araucaria Imbricata	6	2	Sandy loam	Sand	Level	Not healthy
Cedrus Deodara . .	14	10	do.	do.	do.	Healthy
" Atlantica . .	12	9	Loam	Gravel	do.	do.
Abies Douglassi . .	35	44	Sandy loam	Sand	do.	Very healthy
" Menziesii . .	24	29	Loam	Gravel	do.	Healthy
Picea Nobilis . . .	23	27	do.	do.	do.	do.
" Cephalonica .	17	16	do.	do.	do.	do.
" Pinsapo . .	12	9½	do.	do.	do.	Quite healthy
Pinus Lambertiana .	17	19	do.	do.	do.	Healthy
Cupressus Torulosa .	17	12	Sandy loam	West	do.	do.

No. 61.—Gordon Castle, Parish of Bellie, Morayshire. Altitude, 70 feet.

Araucaria Imbricata	15	10	Dark loam	Gravel	Open	Healthy
Cedrus Deodara . .	16	20	do.	do.	do.	Very healthy
" Atlantica . .	4	1	do.	do.	Sheltered	do.
Abies Douglassi . .	5	1½	do.	do.	do.	do.
" Morinda . .	15	10	do.	do.	East	Healthy
Picea Nobilis . . .	2	1	do.	do.	Sheltered	do.
Pinus Laricio . . .	6	5	do.	do.	do.	do.
" Excelsa . . .	15	10	do.	do.	Open	do.
Cupressus Torulosa .	3	3½	do.	do.	Sheltered	A rapid grower
" Lawsonii .	2	1½	do.	do.	do.	Very healthy
Wellingtonia Gigantea	3	2	do.	do.	do.	do.

No. 62.—Tarbat, Parish of Kilmuir-Easter, Ross-shire. Altitude, 6 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	15	9	Yellow loam	Gravel & sand	S.E.	Very good
Cedrus Deodara . .	15	18	do.	do.	do.	do.
Abies Morinda . .	15	10	do.	do.	do.	Healthy
Picea Nobilis . . .	4	1	Light loam	do.	North	Good
Pinus Excelsa . .	15	18	Yellow loam	do.	South	Healthy
" Ponderosa . .	20	25	Light loam	do.	S.W.	do.
Cupressus Torulosa .	15	9	do.	do.	do.	do.
Wellingtonia Gigantea	4	2½	do.	do.	West	Very healthy

No. 63.—Balnagown, Parish of Kilmuir-Easter, Ross-shire. Altitude, 8 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	15	9	Yellow loam	Sand & gravel	S.E.	Very healthy
Cedrus Deodara . .	15	18	do.	do.	do.	do.
Picea Cephalonica .	15	18	do.	Sand	do.	Very good

No. 64.—Forss, Parish of Thurso, Caithness-shire. Altitude, 50 to 60 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	14	8	Stiff	Clay	South	Thriving and healthy
Cedrus Deodara . .	14	10	do.	do.	do.	do.
Abies Douglassi . .	All planted since 1844.	2½	do.	do.	do.	do.
" Menziesii . .		6	do.	do.	do.	do.
" Morinda . .		8	do.	do.	do.	do.
Picea Nobilis . . .		1½	do.	do.	do.	do.
" Cephalonica .		10	do.	do.	do.	do.
" Pinsapo . .		3	do.	do.	do.	do.
Pinus Excelsa . .		7	do.	do.	do.	do.
Cupressus Torulosa .		2½	do.	do.	do.	do.
" Lawsonii .		1½	do.	do.	do.	do.
Thujopsis Borealis .		2	do.	do.	do.	do.
Thuja Gigantea . .		2	do.	do.	do.	do.
Wellingtonia Gigantea		2	do.	do.	do.	do.

No. 65.—Montford, Parish of Rothesay, Buteshire. Altitude, 10 to 100 feet.

Species reported on.	Age in Years.	Height in Feet.	Soil.	Subsoil.	Exposure.	Present condition, &c.
Araucaria Imbricata	15	8	Gravelly	Clay	East	Healthy, and thriving very well
Cedrus Deodara . .	20	15	Loam	do.	do.	do.
" Atlantica . .	5	3	do.	do.	do.	do.
Abies Douglassi . .	12	4	Peat & loam	do.	do.	do.
" Menziesii . .	5	3	do.	Gravelly	do.	do.
Picea Nobilis . . .	3	1	Peat	Clay	do.	do
" Pinsapo . . .	3	1	Loam	do.	do.	do.
Pinus Excelsa . . .	12	4	do.	do.	do.	do.
" Lambertiana .	5	3	Peat	do.	do.	do.
" Macrocarpa .	6	4	do.	do.	do.	do.
Cupressus Torulosa .	7	4	Loam	do.	do.	do.
" Lawsonii .	4	3	Sandy loam	do.	do.	do.
Thujopsis Borealis .	3	1	do.	do.	do.	do.
Thuja Gigantea . .	9	5	Gravelly	do.	do.	do.
" Variegata . .	5	1	Loam	do.	do.	do.
Wellingtonia Gigantea	7	3	Gravelly	do.	do.	do.

ON THE COMPARATIVE VALUE OF MANURE MADE WITH AND WITHOUT COVER.

By Robert Scot Skirving, Camptown, East Lothian.

[Premium—The Gold Medal.]

The experiments, an account of which follows, were made during the years 1860 and 1861, upon a field which was cropped the first of these seasons with potatoes, and the second with wheat.

The soil upon which the experiment was made is a lightish loam of good quality, with a considerable slope towards the north. Previous to the potato crop of 1860 it had carried oats, following two years' pasture. The experimenter's first business was to secure good dung, which had been made in every respect in the same manner, with the exception of the circumstance of cover. For this purpose a shed and court were selected, in which a lot of six cattle had been fed off upon turnips, oil-cake having been added during the last six weeks they were there. As the one portion was entirely exposed to rain, whilst the other was perfectly excluded from it, and as the litter used and the food consumed were identical, the necessary conditions were satisfactorily obtained. Besides the two acres devoted to the experiment, a third was added for the sake of further comparison, which was manured with half the weight of dung and with five cwt. of portable manure, which consisted of guano and dissolved bones in equal quantities. The dung used on this acre was from the open court. The ground experimented on was as equal in quality as could be desired; and it would be difficult to assign a superiority to any one of the three acres. The potatoes used were regents, which were planted on the 12th of April—a long winter and a backward spring having delayed all the operations of seed-time. The dung, which was in good condition, was applied at the period of planting. The three lots were manured in the following manner:—

Lot 1. 20 tons of dung per imperial acre from open court.
Lot 2. 20 tons of dung per imperial acre from covered shed.
Lot 3. 10 tons dung from open court, and a mixture of 2½ cwt. Peruvian guano and 2½ cwt. dissolved bones.

The weather and the state of the soil enabled the seed to be planted and the land worked in a satisfactory manner. During summer all the potatoes looked well, but the acre manured with the covered dung had much more luxuriant tops than the others. In July this was particularly obvious, the stems showing in a very marked manner when looked at even from a considerable distance. They also preserved their vigour to a later period; and to such an extent was this the case, that when, on the 14th October, the shaws of the

covered-shed acre and of the mixed-manure acre were cut off, preparatory to lifting the crop, it was not found necessary to cut those of the open-court acre, so much had they withered away. This conspicuous difference in the lots was indeed the most marked disparity exhibited in any respect by the two sets of experiments.

The potatoes were lifted on the 1st November. They were all a good crop, and were valued by an extensive dealer as worth £35 per Scotch acre. Portions of the field (which is nearly 40 acres in extent) were not so good, and the whole were sold as they grew at £30 per Scotch acre. It must be noted that the summer of 1860 was much drier in the south-east of Scotland than in many other districts, and that there the potato crop was a very good one, and sold at high prices. The crop was carefully lifted with the fork, and the produce of each acre accurately measured, with the following results:—

	Tons.	cwt.	qrs.	st.	lb.	
Lot 1. Open court,	6	6	0	0	0	per imp. acre.
Lot 2. Covered shed,	7	8	2	1	10	do.
Lot 3. Mixed manure,	7	9	1	1	6	do.

These weights represent the total produce per imperial acre. Each lot was pitted separately; and when ultimately sent by the purchaser to London, a note was made of the quantity actually turned out to market, as well as the amount of refuse in each. This note was, unfortunately, lost by a labourer; but I had seen there was a very small percentage of inferior potatoes in all the lots, and that the proportion in each did not differ in any material degree. The difference, indeed, between the two principal lots (the covered and uncovered dung) was not appreciable; but the potatoes produced by the mixed manures were slightly smaller in size than the other two. In consequence of this, the amount of first-class potatoes fit for the London market produced by the covered-shed dung was *slightly in excess* of the mixed-manure lot. There was no disease in the field.

It will be seen from the above that the dung made under cover produced 1 ton, 2 cwt., 2 qrs., 1 st., 10 lb. more potatoes per imperial acre than that made in the open court; whilst the acre manured with dung and guano, &c., while it produced a crop slightly in excess of the covered-shed lot in the first instance, lost that small superiority in the process of sorting for market, and may, for all practical purposes, be accounted of equal value.

I have little doubt that in wet seasons, and in districts where the amount of rainfall is large, the superiority of manure made under cover will be still more marked; whilst in pastoral districts, where the economising of litter is an object, a double advantage will be secured. On the other hand, where a purely arable system of agriculture is followed, and where it is often necessary to trample down as much straw as possible, it might be inexpedient to construct farm offices with a view to the exclusion of rain from the cattle

courts. Besides, most farmers are of opinion that cattle thrive better in well-constructed sheds with open courts than in boxes or byres. On ploughing the ground after the potato crop was removed, I observed that the covered dung was decidedly more visible than the uncovered, and I inferred from thence that there was a greater amount of unexhausted manure in the one acre than in the other.

I now proceed to give an account of the wheat crop which followed the potatoes.

The variety used was that known by the several names of Mongoswells, Lady Hall's, &c.—a white wheat, which is cultivated to a considerable extent.

It was sown under favourable circumstances on the 22d November, and no dung or top-dressing was at any time applied, in order that the action of the manure in the soil might remain perfectly undisturbed. During autumn and winter I cannot say that I observed any difference in the braird of the three acres; but as the season advanced I saw, with regret, that the experiment was disturbed to a material degree by a cause which cannot in any way be attributed to the mode of manuring. The whole northern portion of the field had "thrown out," as it is termed, and the wheat, to a very considerable extent, had died and become blanky; the line of this comparative failure, which was distinctly marked, reached the experiment, and extended over one-fourth of the open-court acre, whilst it did not reach the other two lots.

The crop of 1862 has proved so worthless that it makes that which preceded it appear good by comparison, yet the wheat crop of 1861 was considered at the time a very inferior one. The field which was the subject of this experiment produced a fair return, and it happened to be the only one possessed by the experimenter which did so.

It was my wish to have had the total produce of each of the three acres—straw as well as grain—accurately weighed; but there being no means of doing so in the immediate neighbourhood, I was reluctantly compelled, during the bustle of harvest, to content myself by sending the produce of an equal number of square yards to be weighed. The following figures may indicate pretty exactly the relative weights of the respective crops:—

Portion from open-court dung, ...	15½ cwt.
Do. from covered-shed dung, ...	17 „
Do. from mixed manure, ...	16 „

The measurement of the above equal portions was taken where the "throwing out" had not so distinctly marked itself on the open-court acre.

The wheat was stooked separately, and, shortly after being "carried," was thrashed, weighed, and measured. The following are the results:—

WEIGHT.

Weight of open-court lot per bushel, . . .	60½ lb.
Weight of covered-shed lot per do., . . .	61 „
Weight of mixed-manure lot per do., . . .	60¾ „

QUANTITY—per Imperial Acre.

	Bush.	p.	gall.	qt.	pt.	gills.
No. 1. Open court, good grain, .	29	0	0	0	1	2
„ „ grey do., .	1	3	1	3	1	2
	31	0	0	0	1	0
No. 2. Covered shed, good grain, .	33	0	0	2	1	2
„ „ grey do., .	2	2	0	3	1	2
	35	2	1	2	1	0
No. 3. Mixed manure, good grain, .	30	1	1	0	1	0
„ „ grey do., .	1	3	1	3	1	2
	32	1	1	0	0	2

I cannot give any trustworthy estimate of how much the open-court acre was damaged by the "throwing out;" but my opinion is, that but for that circumstance it would have been little inferior to the other; and the experiment seemed to indicate, contrary to my expectation when the wheat was sown, that a second season had tended to equalise in a great degree the power of the two lots of dung.

This accident is one of many to which agricultural experiments, of every description, are constantly liable; and I think it will not be disputed that many trials, made during various seasons, must be undertaken before results can be definitely and satisfactorily ascertained. So far, however, as this experiment, conducted with all the care it was in my power to bestow, can be founded on, the results seem clearly to indicate, that dung made under cover has, even in a comparatively dry climate, a very decided advantage during the first season over that made in open courts; whilst the second year still shows a superiority, though not in so marked a degree.

ON THE COMPARATIVE EFFECTS OF SPECIAL AND FARMYARD MANURES OVER A FOUR-COURSE ROTATION.

By JOHN DOVE, Eccles-Newtown, Coldstream.

[Premium—£15.]

THE following series of experiments were undertaken with the view of testing the permanent effect of some of the special manures generally used in this district, in comparison with the ordinary manure of the farm. I selected for trial Peruvian guano, superphosphate made from bones, and superphosphate made from coprolite. These are manures of the most distinct character, and generally used in this district. I bought them as the purest of their class, and with a guaranteed analysis. I sent samples of the stock to Dr Macadam to be analysed, and copies of his analysis are given. The farmyard manure used was made by cattle fed on turnips in courts; it was carted out to the field in the beginning of January, and laid into a heap, the carts being driven over it while doing so, and it was turned over in the beginning of April. The cattle had got a small allowance of oilcake for three weeks before I commenced to lead out the dung. The guano was suppled by Messrs J. & J. Cunningham, Edinburgh; the bone superphosphate by Messrs M'Lean & Hope, Leith; and the coprolite superphosphate by Mr Lawes. Dr Macadam's analysis of all the manures corresponded exactly with the guaranteed analysis I got with them, except in the case of the bone superphosphate, in which there was rather a smaller percentage of ammonia than was guaranteed. The field on which the experiments were made was a good clay soil, not very stiff, and having a mixture of black loam in it. It is about 220 feet above the level of the sea, and has a gentle inclination to the south. In 1855 it was drained with tile drains, 3½ feet deep and 30 feet separate, and at the same time got an application of 7½ tons of lime per acre, and was sown with turnips, one-third of which were eaten on the ground by sheep; in 1856 it was barley; in 1857 tares, manured with 2 cwt. per acre of dissolved bones, and cut green for soiling cattle; in 1858 it was wheat, manured with 10 cartloads dung per acre. The experiments were made on two separate portions of the field—No. 1 of the series across the upper half of it, and No. 2 across the under half. There is little difference in the quality of the land—if anything, the upper half has rather the deepest soil; both had been cropped and manured exactly in the same way for three years before, and I had never seen any difference in the crops upon them; and I believe that when I commenced the experiment, the land was as equal in quality and condition as any piece of land of the same

extent that could be found. Each lot consisted of a quarter of an imperial acre, correctly measured and marked off, and ploughed, to avoid any mistakes throughout the rotation.

First Year, on Swedish Turnip. Sown, 18th May 1859; Thinned, 28th July; Lifted and Weighed, 13th January 1860.

No.		Price of Manures.	Total Cost of Manures per acre.	Produce of No. 1 Series per acre.
1	16 tons farmyard manure,	5s. per ton	£4 0 0	11 ton 16 cwt.
2	6 cwt. Peruvian guano,	13s. per cwt.	3 18 0	10 ,, 12 ,,
3	9 ,, bone superphosphate,	8s. 6d. ,,	3 16 6	10 ,, 14 ,,
4	13 ,, coprolite do.	5s. 10d. ,,	3 16 0	10 ,, 14 ,,

No.	Produce of No. 2 Series.		Average of the two Series.		Value of No. 1 at 8s. per ton.	Value of No. 2.	Average Value of the two Series.
	tons	cwt.	tons	cwt.	£ s. d.	£ s. d.	£ s. d.
1	11	18	11	17	4 14 0	4 15 0	4 14 6
2	11	2	10	17	4 4 6	4 8 9	4 6 7½
3	8	14	9	14	4 5 3	3 9 3	3 17 3
4	10	6	10	3	4 0 0	4 2 3	4 1 1½

Second Year, on Barley. Sown, 29th February 1860; Cut, 25th August; Thrashed, 5th September.

Produce of No. 1 Series.

No.	Good corn per acre.		Weight per bush.	Light corn per acre.		Weight per bush.	Straw and chaff per acre.		Value of good corn at 4s. 2d. per bush.	Value of Light at 3s. per bushel.	Value of straw at 1s. per cwt.	Gross value of produce.
	bush.	lb.	lb.	bush.	lb.	lb.	cwt.	st.	£ s. d.	s. d.	£ s. d.	£ s. d.
1	50	22	52½	3	9	45	45	1	10 10 0	9 7	2 5 1½	13 4 8½
2	56	0	52	3	6	42	47	3	11 13 4	9 5	2 7 4½	14 10 1½
3	48	44	52½	3	16	44	34	0	10 3 6	10 0	1 14 0	12 7 6
4	42	35	52½	2	18	45	31	3	8 17 10	7 2	1 11 4½	10 16 4½
	Produce of No. 2 Series.											
1	54	16	52½	3	0	43	46	6	11 6 3	9 0	2 6 9	14 2 0
2	57	10	52½	3	14	43	40	3	11 18 3	10 0	2 0 4½	14 8 7½
3	47	20	52½	3	4	42	36	6	9 17 6	9 3	1 16 9	12 3 6
4	46	48	52½	2	24	44	33	1	9 15 7	7 6	1 13 1½	11 16 2½

Average Value of the Gross Produce of the Two Series.

No. 1,	£13 13 4½	No. 3,	12 5 6
,, 2,	14 9 4½	,, 4,	11 6 3½

THIRD YEAR, ON HAY. Cut, 4th July 1861; Weighed, 11th August.

No.	Produce of No. 1 Series.		Value of hay at 3s. 4d. per cwt.			Produce of No. 2 Series.		Value of hay at 3s. 4d. per cwt.			Average value of the two series per acre.		
	cwt.	st.	£	s.	d.	cwt.	st.	£	s.	d.	£	s.	d.
1	35	0	5	16	8	38	4	6	8	4	6	2	6
2	32	4	5	8	4	35	0	5	16	8	5	12	6
3	31	3	5	4	3	34	0	5	13	4	5	8	9½
4	30	6	5	2	3	33	2	5	10	10	5	6	6½

FOURTH YEAR, ON OATS. Sown, 15th April 1862; Cut, 18th Sept.; Thrashed, 11th Oct.

Produce of No. 1 Series.

No.	Good corn per acre.		Weight per bushel.	Light corn per acre.		Weight per bushel.	Straw and chaff per acre.		Value of good corn at 3s. per bushel.		Value of light at 2s. 6d. per bushel.		Value of straw at 1s. per cwt.			Gross value of produce.		
	bush.	lb.	lb.	bush.	lb.	lb.	cwt.	st.	£	s.	s.	d.	£	s.	d.	£	s.	d.
1	56	14	42¼	3	0	33	53	6	8	9	7	6	2	13	9	11	10	3
2	55	28	42½	3	0	33	51	0	8	7	7	6	2	11	0	11	5	6
3	56	14	42¼	4	0	33	50	0	8	9	10	0	2	10	0	11	9	0
4	57	0	42½	2	16	33	45	4	8	11	6	3	2	5	6	10	11	9
Produce of No. 2 Series.																		
1	53	0	42½	2	16	33	53	0	7	19	6	3	2	13	0	10	18	3
2	52	14	42¾	2	0	33	49	4	7	17	5	0	2	9	6	10	11	6
3	51	14	42½	2	16	33	45	6	7	14	6	3	2	5	9	10	6	0
4	56	0	42½	2	18	33	52	6	8	8	6	5	2	12	9	11	7	2

Average Value of the Gross Produce of the Two Series.

No. 1,	£11	4	3	No. 3,	£10	17	6
„ 2,	10	18	6	„ 4,	10	19	5½

Total Value per Acre of the Four Years' Produce of the different Manures, taking the average of the Two Series.

No. 1,	Farmyard manure,	£36	6	10
„ 2,	Peruvian guano,	35	9	2¾
„ 3,	Bone superphosphate,	32	11	3
„ 4,	Coprolite superphosphate,	32	5	5½

Remarks on the first year's experiment.—In 1859 the turnip crop in this district was one of the worst ever grown in it. They were sown in pretty good order, and brairded very well; but the

weather in the end of June and July was very cold and backward, and they were long in being ready for thinning. The weather was favourable in August and September, and they looked pretty well in the beginning of October, but we then had a severe frost which completely checked their growth before they were much more than half a crop; their quality also was very much injured.

In this experiment all the lots brairded well, and when they were thinned there was scarcely a single blank in any of them, and no difference in their state of forwardness, and all through their growth I could observe little or no difference in the appearance of any of them. I allowed them to stand till after the New Year, in the hope that they would still improve if we had better weather, as Swedish turnips in this district often make great improvement during the months of November and December, even after a pretty severe frost; but the weather continued unfavourable, and they made no more progress, but lost quality. There were very few completely rotted in any of the lots, and, though injured, they were all very equal in quality. There was no difference in the specific gravity of any of them. As an experiment in growing turnips, I would not place much reliance on this one; but I do not consider that the comparative failure of the first crop will make the experiment of much less value as a trial of the permanent effect of the different manures. The turnips being only about half a crop, would not exhaust so much of any of the manures as a full crop would do, and a greater quantity of them would be left for action on the after-crops than if a full crop had been grown and all carried off the ground, as was the case in this experiment. The turnips were all carried off the land and consumed by cattle: the shaws were so completely destroyed by the frost that they were not worth lifting and weighing. There were no leaves left—only the stocks.

Remarks on the second year's experiment.—After the turnips were removed, the land was ploughed in very good order. It was sown with chevalier barley at the rate of 3 bushels per acre. Having been exposed to the action of the frost for some time after it was ploughed, it was easily reduced to a fine mould, and the barley brairded very equally. No difference could be noticed on the appearance of any of the lots for the first six weeks of their growth; but in the end of May, No. 2 in both series had taken a decided lead; it was longer and more vigorous-looking. They all came into ear exactly at the same time, and after they were full shot out the difference could not be so much noticed. They were all a very even crop, and the weather being favourable before harvest they all stood well up. There was only a very small spot in No. 2 of the first series a little laid. The weather continued favourable after they were cut, and I thrashed the barley off the stook. I got a fine day for doing so, and they were all in equally good condition. I sold the barley at the price stated; the straw I have stated at a

price considerably below the ordinary value of straw in this district, for this reason, that though it was in good enough condition for thrashing, if it had stood in a stack for some time it would have dried very much, and there would have been considerably less weight per acre. I have done the same in the oat experiment. None of the crop being laid, the straw on all the lots was, so far as I can judge, equal in quality. I am not sufficiently well acquainted with chemistry to be able to find out if there was any difference in the constituent parts of any of them; and the produce of half an acre of each was too small a quantity of straw on which to make an attempt to find out by practical experiment if there was any difference in their value either as fodder or litter.

Remarks on the third year's experiment.—This year the manures had a very fair trial, as the grasses on all the lots were very equally planted; they were sown amongst the barley on the 15th March, and were composed of a mixture of 10 lb. red clover, 6 lb. yellow clover, half a bushel foreign Italian ryegrass, and half a bushel Ayrshire annual ryegrass, per acre. They all brairded pretty well, and as the barley stood well up, none of them were rotted out, and they all stood well through the winter. The ryegrasses succeeded best; there was rather too large a proportion of them, and too small of the clovers, but they were as nearly as possible equal on all the lots. I allowed the hay to be pretty well ripened before I cut it—riper than I generally allow it to be. The weather was favourable for making it, and it was got up in good condition, and was all good in quality. I sold it at the price stated. The aftermath was not cut—it was eaten on the ground by sheep, being the only part of the four years' produce that was consumed on the land.

Remarks on the fourth year's experiment.—The lots were ploughed out of the lea in end of January. I made one man plough them all, so that there should be no difference in the workmanship; one man also sowed them all with potato oats, one bushel on each lot—being at the rate of four bushels per acre. The weather was wet in March and the first week of April, and the land was not in condition for sowing till the second week, but we then had a good though late seed-time, and the land, having been exposed to the action of the frost for some time, was easily reduced to a fine mould. The lots all brairded well and equally; they all looked very well at the end of May, and were then about sufficiently far advanced for the time of year. I could not notice any difference in the growth of any of them. The summer was cold and backward, and the crop was long in ripening. It grew well, however, and was a bulky one—being all a good deal laid, but not so much so as to injure the crop in the least. There was almost no difference in the appearance of any of the lots, and after they were cut I could not say which would be the best crop. The straw, though laid, was not injured in quality; and, so far as I could judge, there was not the slightest difference in the quality of any of the lots.

Throughout the whole series of years the farmyard manure has proved the best, but the guano is not much behind it. In the last year's experiment there is one rather peculiar circumstance: here there is a greater difference in the proportion of corn to the straw than in the gross weight of the produce of each lot. I weighed the whole produce of each lot as it was carted from the field before thrashing it. Each was thrashed separately. I then deducted the weight of the produce of corn on each from the gross weight; this left the remainder for straw and chaff. I give the gross weight of the produce of each lot:—

	No. 1 Series.	*No. 2 Series.*
No. 1,	19 cwt.	18 cwt. 4 stone.
„ 2,	18 „ 2 stone.	17 „ 4 „
„ 3,	18 „	16 „ 4 „
„ 4,	17 „	18 „ 2 „

Comparing this with the previous table of produce, it will be seen that there is a considerable difference in the quantity of corn from the same weight of gross produce in several of the lots: the special manures give a larger proportion of corn to straw than the farmyard manure. I cannot give any explanation of this; the farmyard manure lots were not more laid than the others, and none of them were so much laid as to interfere with their yield. None of them gave so well as I expected they would before thrashing them. In this district the crops did not give so well to the straw in 1862 as usual; the cold summer seems to have interfered with their filling properly. In ordinary seasons on similar land, and from the same bulk of straw, I would have had nearly one quarter of oats per acre more than was on any of the lots.

ANALYSIS OF THE MANURES USED.

Peruvian Guano.

Water,		11.16
Organic matter and ammonia,		53.32
Alkaline salts,		7.60
Phosphates,		25.04
Silica,		2.88
		100.00
Ammonia,	17.16	
Phosphoric acid in combination with alkalies, equal to ordinary bone phosphate rendered soluble,	6.82	

Coprolite Superphosphate.

Soluble phosphate of lime,		14.68
Equal to ordinary phosphates rendered soluble,	22.80	
Insoluble phosphates,		17.12
Hydrated sulphate of lime,		43.00
Hydrated sulphuric acid,		4.52
Carry forward,		79.32

Brought forward,		79.32
Alkaline salts,		5.36
Silica,		4.04
Organic matter, moisture, and ammonia,		11.28
		100.00
Ammonia,	0.58	
Equal to crystallised sulphate of ammonia,	2.56	

Bones Superphosphate.

Organic matter, ammonia, and moisture,		30.92
Soluble phosphate of lime,		11.33
Equal to ordinary phosphates rendered soluble,	17.68	
Insoluble phosphates,		14.72
Hydrated sulphate of lime,		30.49
Hydrated sulphuric acid,		4.24
Alkaline salts,		4.96
Silica,		3.34
		100.00
Ammonia,	1.87	
Equal to crystallised sulphate of ammonia,	8.25	

REPORT OF PROCEEDINGS IN THE EDINBURGH VETERINARY COLLEGE.

By PROFESSOR DICK.

SUMMARY OF CASES, comprising DISEASES, INJURIES, &c., amongst DOMESTICATED ANIMALS, registered in the CLINICAL TRANSACTIONS of the EDINBURGH VETERINARY COLLEGE, which have been under treatment during the months of October, November, and December 1863.

	Horses.	Cattle and Sheep.	Dogs, &c.
Abscesses in various parts,	7	1	...
Abortion,	...	1	...
Angleberries, removal of,	1	...	...
Apthæ epizootica (murrain),	...	16	...
Ascites,	...	...	1
Bone, disease of,	1	...	...
,, fractures of,	6	1	1
Brain, disease of,	1	...	...
Broken knees,	4	...	...
Bursæ, distension of, with lameness,	2	...	...
Calculus, vesical,	1	...	...
Canker in the ear,	...	...	1
Castration,	1	...	...
Catarrh and sore throat,	55	...	2
Chorea,	1	...	2
Colic,	45	...	...
Constipation (obstinate),	3	...	2
Cracked heels,	6	...	...
Curbs, with lameness,	6	...	...

	Horses.	Cattle and Sheep.	Dogs, &c.
Debility, constitutional,	2	...	...
Diabetes,	6	...	...
Diarrhœa,	1	1	...
Distemper,	...	...	8
Emphysema,	1	...	...
Enteritis,	1	...	...
Examinations as to soundness,	75	1	...
Eyes, diseases, &c. of,	3	...	4
Fardel-bound,	...	1	...
Feet, corns in, with lameness,	3	...	...
„ inflammation in,	3	...	...
„ navicular disease in,	40	...	...
„ pricks in,	15	...	...
„ quittors in,	3	...	...
„ sandcracks in,	4	...	...
„ seedy toe in,	2	...	...
„ side-bones in,	3	...	...
„ thrushes in,	2	...	...
„ wounds and bruises in,	29	...	...
Grease,	2	...	...
Gastritis,	...	...	1
Head, injury of,	1	...	...
Hernia, ventral,	...	2	...
Heart, diseases of,	1	2	...
„ rupture of,	1	...	...
Hip-joint, dislocation of,	...	...	1
Indigestion, chronic and acute,	3	1	1
Influenza,	29	...	...
Lameness, coffin-joint,	1	...	...
„ elbow,	2	...	...
„ fetlock,	4	...	...
„ hip,	17	...	...
„ hock,	4	...	...
„ knee,	1	...	...
„ shoulder,	2	...	...
„ stifle,	3	...	...
Mange,	15	...	5
Nasal gleet,	3	...	...
Neurotomy,	1	...	...
Over-exertion,	1	...	...
Over-grown claws,	...	...	1
Paralysis,	...	...	2
Parturition, difficult,	...	...	2
Phthisis pulmonalis,	...	...	1
Pleurisy and pneumonia,	4	...	...
Pleura-pneumonia,	...	6	...
Purpura hæmorrhagica,	1	...	...
Rectum, injury of,	1	...	...
Ringbones, with lameness,	4	...	...
Roaring, thick and broken wind,	5	...	...
Shoulder slip,	1	...	...
Sore neck,	1	...	...
Spavin, with lameness,	13	...	...

	Horses.	Cattle and Sheep.	Dogs, &c.
Spine, injury of,	2	...	...
Splints, with lameness,	9	...	...
Sprains, muscles,	3	...	...
„ tendons, ligaments, &c.,	25	...	...
Stomach, rupture of,	1	...	...
„ staggers,	5	...	...
Strangles,	1	...	...
Teeth, diseases, &c. of,	8	...	...
Tetanus,	1	...	...
Treads,	2	...	...
Tumours, various,	7	1	3
Venæ cavæ, rupture of,	1	...	...
Vomiting,	...	...	1
Weed,	5	...	...
Worms, intestinal,	6	...	2
„ bronchial,	...	2	...
Wounds and bruises in other parts than feet,	22	...	...

General Abstract.

Cases amongst horses,	552
„ „ cattle and sheep,	36
„ „ dogs, &c.,	41
Total,	629

Among the many modifying influences affecting the type of epidemics and epizootics, no medical fact is better established by observation and experience than this, that the differences in the constitution of the seasons, as well as changes of the seasons themselves, greatly influence the nature and character of prevailing diseases. This fact is very clearly exemplified by comparing the summary of the cases registered in the College during the three months ending December 31, with those of the preceding quarter. It will be noticed, that a considerable increase has taken place in the number of cases of disease affecting the organs of respiration, more especially in the form usually denominated influenza. This is a disease which may occur at any period of the year, but it is found to be most prevalent during the autumn and spring months. It generally occurs as an epizootic, affecting simultaneously whole districts, and is in all probability produced by sudden changes, either of the temperature of the atmosphere, or its humidity. It is otherwise impossible to account satisfactorily for the frequent outbreaks of the disease, which accompany the sudden transitions, in our variable climate, from heat to cold, from cold to heat, or from cold dry, to moist and foggy weather. It occurs under a variety of forms—one season appearing as a sort of epizootic catarrh, the disease being confined to the upper air-passages; at another as broncho-pneumonia, the bronchial tubes and substance of the lungs being the parts chiefly

affected; in a third as pleuro-pneumonia, the lungs and their covering membrane being the seat of the affection; while at other times the liver and other digestive organs seem to participate in the disease. It may, however, be correctly defined as typhoid, and the morbid changes to consist in sub-acute inflammation, or a passive congested state of the lining membrane of the respiratory tract, frequently extending to the substance of the lungs, and to their investing membrane, the pleura. It is always accompanied by fever, and to a greater or less extent with derangement of the heart, and by excessive lassitude and weakness, which, in my opinion, is one of the most marked characteristics of the disease. Young horses, and those of the heavy or cart breeds, are most liable to its attacks, and in the latter it is always more severe than in those having more breeding; in fact, we always find that coarse-bred horses suffer more from, and are less able to withstand the effects of, debilitating diseases than well-bred horses. Influenza is ushered in by dulness, loss of appetite, shivering, the eyes becoming clouded, and tears flowing down the cheeks. These symptoms are speedily followed by quickened breathing, quick weak pulse, and a frequent painful cough, aggravated by deglutition, or even an attempt made to swallow. The progress of the disease is sometimes arrested in this stage, but in a greater number of cases other symptoms make their appearance—great debility sets in, a copious effusion of mucus is discharged from the nose, the mouth becomes hot and dry, pulse quick and small, visible mucous membranes become red and injected, and, should the liver have become involved, they are tinged with yellow. The temperature of the body varies, being sometimes hot and sometimes cold, but chiefly noticed in the ears and legs. The urine becomes high-coloured, and the fæcal discharges hard, scanty, and light in colour. As the disease goes on increasing in intensity, the debility increases, the dulness becomes stupor, the discharge from the nose also increases, the cough gets worse, while the pulse becomes quicker and weaker, and also irregular, and a well-marked line or ridge appears along the under side of the flanks, the breathing becoming almost abdominal. The prostration continues, and the animal sinks from sheer exhaustion. When a favourable change makes its appearance, it is ushered in usually by a copious nasal discharge, and the resumption in the extremities of their natural temperature, while the breathing and pulsations become more natural, and the coat, which has hitherto been dry and staring, assumes its sleek and healthy appearance.

On observing an animal attacked with this insidious disease, the first step to be taken is to place it in a well-ventilated loose-box, with plenty of clean dry litter; to clothe its body with warm rugs, to bandage its legs, and otherwise to attend to its comfort. By simply attending to these precautionary measures in the primary stage, many animals will recover without any other medical treatment. Blood-letting ought not to be resorted to unless in the very

early stages, when I have seen it do good. As a rule I would advise abstaining from this practice. If the bowels are very much constipated, I would recommend a small dose of aloes, in quantity not sufficient to purge, on the ground of avoiding the great danger, in these low typhoid diseases, of bringing on superpurgation, and increasing the weakness. The bowels may be kept in order by the use of glysters of soap and water. Alterative medicines, such as nitrate of potash in combination with camphor, will be found of great service, along with a blister to the throat, and, if possible, a plentiful supply of water in which nitre has been dissolved. Should the lungs or pleura become involved, a strong blister of cantharides, or cloths wrung out of hot water, applied to the sides, will prove advantageous. If the cough be troublesome, sweet spirits of nitre and extract of belladonna should be given. In cases where there is great prostration and weakness, give stimulants, such as warm ale, port-wine, carbonate of ammonia, sweet spirits of nitre, or ether. When all chances of a relapse have passed off, then tonics and diuretics must be administered. In all cases every endeavour should be made to get the animal to eat, by placing before him good nutritious diet—such as green food, carrots or bran mashes mixed with crushed corn or malt—at the same time supplying him with thin gruel or cold water to drink.

A very severe and rapid case of purpura hæmorrhagica occurred during the quarter in the stables of a large postmaster in town. The patient was a bay thorough-bred mare, which had been sent to Edinburgh for sale. She had been used for racing purposes, and had proved successful at several meetings. She was first observed to be ill on the morning of Saturday the 28th of November, when I was sent for. On examination I at once diagnosed it to be a case of purpura. The symptoms presenting themselves were: she was blowing hard, the breathing also very much troubled; pulse soft and faint; the head and neck very much swollen, and the lips tumefied; the appetite was quite gone, and purple spots were observed on the lining membrane of the nose. In the following morning, on my again visiting her, I found the swelling of the head, neck, and lips was considerably increased, and had extended down to the breast, the swellings being soft and pitting on pressure, the skin hot and painful; the breathing had become much quicker, and, in addition, a suffocating cough had supervened, with a bloody discharge from both nostrils. From the severity and urgency of the symptoms, I had little or no hope of her recovery, the symptoms indicating the lungs to be affected in a very serious manner. However, I ordered her stimulants, as port-wine, with mineral tonics, and to have plenty of fresh air, her legs to be bandaged, and her body well clothed. As I prognosed, the disease proved fatal—she succumbing early on the Monday morning from suffocation. I had the carcass brought to the College-yard on the Monday morning, and a post-mortem examina-

tion made. On removing the skin, extensive extravasations of blood were found throughout the whole extent of the head, neck, and fore extremities. The nostrils were full of blood, and on opening the trachea or windpipe, it was found filled with bloody frothy mucus. The chest contained a large quantity of bloody serum, the lungs were highly congested, and, on cutting into them, the air-tubes were filled with frothy bloody mucus. The heart was larger than natural, very soft and flabby, and was filled with dark uncoagulated blood, as were the large veins. The blood, on exposure to the air, changed its colour from purple to a brilliant scarlet colour. The mucous coats of the intestines also showed purple blotches, but not to any considerable extent or marked degree. I may remark that the animal was excessively fat internally.

In this disease I have always found, when the lungs become involved—which may be diagnosed by the quick troubled breathing—that the case almost invariably proves fatal, although I do not remember one where death followed so rapidly as in this. On inquiry, I learned that the animal had been in apparent good health on the day previous, having been out at exercise, and that she possessed a good appetite, but her coat always appeared on end.

This is a well-marked example of a fatal attack not dependent on any apparent exciting cause—such as excessive previous fatigue, or long exposure to cold, or, as is frequently the case in purpura, succeeding some debilitating disease, as strangles or influenza, when the blood has been deteriorated.

Amongst the cases recorded is a very curious one of emphysema, produced by a simple wound in front of the chest, just below the arm. On the 22d of November last I was requested to visit a mare belonging to a gentleman residing in the city. On my arrival at the stables I found her presenting a peculiar appearance, the whole body, from head to tail, being emphysematous, the swelling extending as low down as the knees and hocks. When the body was gently pressed with the fingers, a peculiar crackling or crepitating sound was produced, and when tapped, the skin resounded like a drum. On inquiry, I learnt from the groom that on the previous day, when his master was out hunting on the mare, and just at the commencement of the run, the animal had struck her chest against a stake. The gentleman, on examination, finding only a small wound of about an inch in extent, on the inner side, and to the front, of the off elbow-joint, and thinking it of very trifling import, remounted and rode her after the hounds. At the finish of the day's sport he rode her home to the stables in Edinburgh, a distance of about 15 miles, without noticing any bad symptoms. With the exception of a slight swelling or puffiness of the skin, nothing appeared amiss. The swelling, however, after reaching home, continuing to increase, and the owner becoming alarmed, I was sent for. After a careful examination, I could find no lesion, excepting the small wound before-

mentioned, which was a punctured one, and only through the skin. The pulse was quite natural; the animal, with the exception of the swelling, and appearing a little nauseated, was in good health and condition. I gave her a dose of laxative medicine, and punctured the skin in sundry places where the swelling was greatest; ordered her to be well clothed, to be kept perfectly quiet, and to have a soft laxative diet. The following day the swelling had slightly subsided, the mare keeping well and eating her food. The swelling decreased daily, and in little more than a week had resumed its natural state.

Cases of emphysema are very uncommon, and may occur in one of three ways. In the first place, we may have it following a simple punctured skin wound in particular parts of the body, more especially if the wound has been produced by a blunt instrument, which, in penetrating the skin, forces a portion inwards, forming a sort of flap or valve. In the case of this mare the wound was situated in a part where there is a large quantity of loose skin and cellular tissue, and great motion. Now, at every step the animal took, air would be sucked into the wound, and prevented from returning by the valvular flap. The air, by every fresh addition, would be forced into the meshes of the subcutaneous cellular tissue, until the whole became infiltrated, or, at any rate, the quantity would increase as long as the animal was kept in motion. In this form of emphysema very little treatment is necessary; all that is required is to puncture the skin at those parts where there are large accumulations of air, and to keep the animal quiet and the bowels open.

The second form of emphysema sometimes follows or is caused by the fracture of one or more ribs, the end of the rib penetrating and wounding the lungs and the pleura costalis, at the same time the skin remaining uninjured and entire. The inspired air in such a lesion finds its way from the lungs into the thoracic cavity, and thence through the opening into the cellular tissue below the skin, and gradually diffuses itself over the whole of that side of the chest, and sometimes, in bad cases, over the whole body. In these cases, as in the former, the skin must be freely punctured so as to allow the air to escape, the animal must be kept quiet, and fever medicines, as nitre, administered.

The third variety of emphysema is caused by penetrating wounds into the chest or the windpipe, caused by sharp instruments. In such cases the instrument, after penetrating the thorax and wounding the lung, is withdrawn, and the external wound not being of sufficient size or in such a situation as to allow the whole of the air escaping from the wound in the lungs to be discharged externally, part becomes infiltrated into the cellular tissue beneath the skin; or, again, the valvular form of the external wound may allow a certain quantity of air to be admitted during inspiration which cannot escape during expiration, but produces emphysema and all its consequences.

Wounds of the thorax, whether inflicted by fractured ribs or the penetration of any instrument, are frequently productive of very serious consequences, besides being the cause of emphysema—such as hæmorrhage, accumulation of air in the thoracic cavity, inflammation of the lining membrane of the cavity, or of the lungs themselves. Hæmorrhage may proceed from some wounded vessel in the walls of the thorax—such as the intercostal artery—when the blood may either escape through the external opening or into the chest, where it accumulates, causing what is termed hæmato-thorax. Again, the blood may escape from some vessel in the lung, where, in addition to hæmato-thorax, there is the danger of its finding its way into the bronchial tubes, producing hæmoptysis, which may be recognised by a discharge of blood from the nose. An accumulation of air in the pleural cavity constitutes what is termed pneumo-thorax, which may exist with or without emphysema. In both this and hæmato-thorax there is more or less oppression in the breathing, with dulness on percussion in the case of accumulation of blood, and great resonance in that of air; in both the pulse is feeble and irregular. Pleurisy, or inflammation of the membrane lining the cavity, and pneumonia, or inflammation of the lungs, may proceed directly from wounds of the walls or of the lungs, or supervene on hæmato-thorax or pneumo-thorax. A case of pleurisy following fracture of the ribs, where there was neither emphysema nor any of the above-mentioned lesions, occurred in the practice of the College on the 24th of November in a horse belonging to a carter at Craigleith. The horse, while drawing a load of stones from the quarry, fell, and besides other injuries, broke one of his ribs, which, by wounding the costal pleura, set up acute inflammation in that membrane. The pulse was hard and wiry, and the breathing quick and oppressed, with a short cough, &c. The treatment consisted in blood-letting, a dose of laxative medicine, and a plentiful supply of cold water in which nitre had been dissolved. The horse gradually recovered.

Amongst the cases recorded during the quarter is one which did not occur in the College practice, but which, from its extraordinary character, is, I think, worthy of being placed on record,—I mean the case of rupture of the heart. It occurred in the practice of Mr Lawson, veterinary surgeon, of Manchester, an old alumnus of the College, who kindly forwarded me the morbid specimen just as he had removed it from the animal. The heart presents a large oblique rent, of about four inches in length, in the external wall of the left ventricle. On laying open the cavity, the rupture was found much less in extent internally than it was on the outside, the internal rent measuring only about two inches. From the appearance of the rupture, there can, I think, be no doubt of its having taken place suddenly—at first probably very small, but gradually increasing in extent; the walls of the heart, its lining membrane, its valves, and also the aorta or large vessel leaving the ventricle, all appeared per-

fectly healthy. The muscular walls were quite firm, although pale, but this can be readily accounted for by the great loss of blood ensuing on such a serious lesion. The only apparent change was a slight discoloration around the edges of the laceration. In a letter from Mr Lawson, which accompanied the specimen, he says:—"On opening the chest a few quarts of serum escaped, and the pleura was much inflamed; the lungs were also much congested; but what attracted most attention was the enormous size of the pericardial sac; and on cutting into it, a quantity of serum escaped, and a clot of blood which weighed no less than eleven pounds." The horse, on his arrival at Mr Lawson's establishment, presented the following symptoms:—"Had his mouth wide open, as if gasping for breath, and had a very weak and very intermittent pulse. These symptoms gradually increased, but still bore the same character, until he died." I regret that I cannot detail more minutely the circumstances under which the animal was placed when these urgent symptoms were first noticed, but hope to be able to furnish in the next quarter's report further particulars.

In the last quarter's report, a case of rupture of the venæ cavæ is recorded—a lesion which I stated was extremely rare, having never met with a similar one in the whole course of my practice. It is, however, somewhat singular that I have to report a fatal case from the same cause, so immediately occurring in the practice of the College as in the quarter at present under review. On the morning of Monday the 14th of December, I was requested to proceed to a knacker's yard at the back of the Castle, to make a post-mortem examination of a horse that had died very suddenly the preceding day. Being engaged at the time, I requested Mr Strangeways to proceed to the place and make the necessary examination. On his return he reported as follows:—"On opening the chest it was found filled with blood, which being removed, the heart and large blood-vessels connected with it were carefully examined, when a large rupture was discovered in the posterior venæ cavæ, a short distance from the heart. The rupture was about an inch in extent; the coats of the vessel at the part were very thin, and presented the appearance of having been dilated." As no other lesion could be found, it was obvious that the great and rapid loss of the vital fluid from the rupture had been the immediate cause of the sudden death of the animal. On inquiry, I learnt that the mare, which belonged to a gentleman residing in the suburbs of the city, had been driven to church in a light carriage by the groom, and appeared in her usual good health. On returning home, she proceeded so far all right, but then began to reel, when she suddenly dropped, and after a few struggles, accompanied by heavy sighs and laboured breathing, died. Cases of sudden death from diseases of the heart and large blood-vessels, or other causes, not only in the horse, but also in man, are, without doubt,

on the increase, and form a fitting subject for physiological research. A paper in a recent number of the 'Cornhill Magazine,' on the "Philosophy of Training," throws some light on this subject, and, in my opinion, deserves careful consideration. The writer argues that in training—and most of the horses intended for fast work undergo, to a certain extent, a species of training—"the muscular system has been forced into undue development, and this development has been at the expense of the general vitality." As a proof of the truth of this, I need only refer to the case of the racing mare, in the earlier part of this paper, where the vitality of the blood had undergone a serious change. The above writer, speaking of the athletes of Rome, says, on the authority of Sinclair, "they were short-lived, and liable to rupture of blood-vessels, to apoplexy, and lethargic complaints. The training system," he goes on to remark, "is a forcing system; were it continued long would kill; even for a brief space is injurious. It is an exceptional process for an exceptional result, not the normal process for a healthy organism."

Amongst the cases of tumours was one of an enormous size, situated at the side of the withers, just behind the shoulder, in a large grey Clydesdale horse, the property of a carting agent in town. The size of the tumour, and particularly its situation, being in the seat of the saddle, interfered so much with the usefulness of the animal, that the owner determined to have it removed. The horse was brought to the College-yard, and cast in the usual manner and properly secured; a free crucial incision was then made down to the substance of the tumour, and the skin dissected from it. After this, as much as possible was removed with a knife, it being difficult to get the whole mass away, owing to the extensive adhesions between it and the neighbouring parts. After dissecting out the greater part of the tumour, the few small arteries cut through during the operation were secured with ligatures, and the skin brought together by metallic sutures. The animal was then allowed to rise, the wound dressed with cloths dipped in cold water, and a dose of laxative medicine administered. The wound, as might be expected from its extent, did not heal by the first intention, but inflamed and suppurated, when the sutures were removed and the part treated as an open ulcer or sore. It was dressed daily with a pledget of tow saturated with a weak solution of acetate of zinc, the strength of the animal supported with tonics and good food. Healthy granulations sprang up, and the wound rapidly healed, without producing any bad consequences—the skin gradually closing, and leaving but a comparatively small cicatrice. The animal is now able to work, which he was quite unable to do before the operation, although there is still a slight enlargement in the part. The tumour, of which nearly 12 pounds was removed, belonged to the fatty variety, *adipose sarcoma,* bearing a close resemblance to ordinary fat, with which it corresponded in structure, only appeared a

little darker in colour. The only other case of tumour worthy of notice in the horse, was one of the melanotic variety, which occurred in a grey horse. It was very large, and was so closely connected with the rectum, that I considered operative interference dangerous. This variety consists in a deposit of colouring matter, and is rarely met with in the horse, excepting in those of a white or grey colour. They occur in any organ or tissue, but generally are found of greatest extent in the neighbourhood of tail and anus. The only plan of treatment is excision, but is very frequently unsatisfactory, owing to their rapid return, the cause of the deposits being entirely constitutional.

PREMIUMS AWARDED BY THE SOCIETY IN 1863.

NOTE.--The awards at Kelso Show, having already been published, are excluded.

REPORTS.

1. L.20 to Archibald Sturrock, Struthers Cottage, Kilmarnock, for a paper on grasses.
2. Gold Medal, or L.10, to James M'Gillivray, V.S., Bonnytown, Rayne, Aberdeenshire, for a Report on internal parasites in domestic animals.
3. Gold Medal, or L.10, to Charles Sangster, Balnabreck, Brechin, for a Report on the reclamation of waste land.
4. Gold Medal, or L.10, to Robert Scot Skirving, Camptown, Drem, for a Report on the effect of manure made with and without cover.
5. Gold Medal, or L.10, to Robert J. Thomson, Grange Farm, Kilmarnock, for a Report on phosphatic and ammoniacal manures.
6. Gold Medal, or L.10, to Robert J. Thomson, Grange Farm, Kilmarnock, for a Report on soluble and insoluble phosphates.
7. Gold Medal, or L.10, to Jacob Wilson, Manor House, Morpeth, for a Report on reaping-machines.
8. Gold Medal, or L.10, to William Walker, Ardhuncart, Mossat, Aberdeenshire, for a Report on autumn manuring.
9. Medium Gold Medal, or L.5, to Hugh Borthwick, Traquair Knowe, Peebles, for a Report on foot-rot in sheep.
10. Medium Gold Medal, or L.5, to John Morrison, Manager, Drummond's Nurseries, Coney Park, Stirling, for a Report on mixed plantations.
11. Medium Gold Medal, or L.5, to Robert Hutchison of Carlowrie, Kirkliston, for a Report on breeding hunters and roadsters.
12. Medium Gold Medal, or L.5, to Samuel D. Shirriff, Saltcoats, Drem, for a Report on soluble and insoluble phosphates.
13. Medium Gold Medal, or L.5, to Robert J. Thomson, Grange, Kilmarnock, for a Report on the cultivation of mangold-wurzel.
14. Silver Medal to Professor Cameron, Public Analyst to the City of Dublin, for a Report on soluble and insoluble phosphates.

DISTRICT COMPETITIONS.

CATTLE.

The District of Lorn.

BULLS.		Charles A. Stewart of Achnacoon, Appin,	Silver Medal.		
BULLS, Class I.*	1.	Duncan Clerk, Duntannachan, Oban,	L.8	0	0
	2.	John Stevenson, Balliemore, Oban,	4	0	0
BULLS, Class II.†		Duncan M'Callum, Clenamachrie, Oban,	2	10	0‡
HEIFERS.	1.	Donald Sinclair, Achinreir, Bonaw,	5	0	0
	2.	John Stevenson, Balliemore, Oban,	3	0	0

The District of Mar.

BULLS, Class I.	1.	Silvester Campbell, Kinnellar, Blackburn,	L.8	0	0
	2.	John Wilken, Sauchen, Cluny,	4	0	0
BULLS, Class II.		John Innes, Wogle, Kinnellar, Blackburn,	5	0	0
HEIFERS.	1.	James Macknight, Boghead, Pitcaple,	2	10	0‡
	2.	Dr Trail, Tombeg, Monymusk,	1	10	0‡

The County of Ayr.

BULLS, Class I.	1.	Wm. Barbour, Broomhill, Dundonald,	L.8	0	0
	2.	James Findlay, Lyonston, Maybole,	4	0	0
BULLS, Class II.		Robert Smith, Whitehill, Ochiltree,	5	0	0
HEIFERS.	1.	Robert Caldwell, Knockshoggle, Coylton,	5	0	0
	2.	Hugh Vass, Fail Mains, Tarbolton, Ayr,	3	0	0

The County of Renfrew.

BULLS.		Alexander Graham of Capellie, Neilston,	Silver Medal.		
BULLS, Class I.	1.	Alexander Holms, Japstone, Neilston,	L.4	0	0‡
	2.	John Miller, Arkleston, Paisley,	2	0	0‡
BULLS, Class II.		John Muir, Porterfield, Renfrew,	5	0	0
HEIFERS.	1.	Andrew Faulds, Broadlees,	2	10	0‡
	2.	Peter M'Dermid, Cowfeeder, Paisley,	1	10	0‡

The County of Stirling.

BULLS.		William Stirling of Keir, M.P., Dunblane,	Silver Medal.		
BULLS, Class II.		A. & A. Mitchell, Alloa,	L.5	0	0
HEIFERS.	1.	George Pender, Dumbreck, Kilsyth,	5	0	0
	2.	John Anderson, Smithston, Cumbernauld,	3	0	0

The County of Inverness.

BULLS, Class I.	1.	Alexander Mackenzie, Alanfearn,	L.4	0	0‡
	2.	Robert Anderson, Kildrummie, Nairn,	2	0	0‡
BULLS, Class II.		James M'Pherson, Drummore of Cantray, Croy,	5	0	0

The District of Strathbogie.

BULLS.		Robert Simpson of Cobairdy, Huntly,	Silver Medal.		
BULLS, Class I.	1.	Charles Walker, Drumblair, Huntly,	L.8	0	0
	2.	Charles Bruce, Broadland, Huntly,	4	0	0
BULLS, Class II.		Alexander Watt, Thomaston, Huntly,	5	0	0
HEIFERS.	1.	Alexander Paterson, Mulben, Keith,	5	0	0
	2.	Alexander Paterson, Mulben, Keith,	3	0	0

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* Class I., Bulls calved before 1st January 1861.
† Class II., Bulls calved after 1st January 1861.
‡ Half Premium awarded, the number of lots being under six.

The District of Strontian.

BULLS, Class I.	1. Hugh Maclaine, Rahoy, Bonaw, . .	L.8 0 0
	2. Alexander Cameron, Glenforslane, Strontian,	4 0 0
HEIFERS.	1. Donald M'Vean, Salachan, Bonaw, . .	5 0 0
	2. Hugh Maclaine, Rahoy, Bonaw, . .	3 0 0

The Island of Skye.

BULLS, Class I.	1. John Stewart of Duntulm, Portree, .	L.4 0 0*
	2. Dr N. Martin, Glendale, Dunvegan, .	2 0 0*
BULLS, Class II.	John Stewart, Duntulm, Portree, . .	2 10 0*
HEIFERS.	1. John Stewart, Duntulm, Portree, . .	2 10 0*
	2. John Stewart, Duntulm, Portree, . .	1 10 0*

The County of Banff and District of Turriff.

BULLS.	James Lumsden, Braco, Keith, . .	Silver Medal.
BULLS, Class I.	1. Andrew Longmore, Rettie, Banff, . .	L.8 0 0
	2. J. & A. Longmore, Baldavie, Banff, .	4 0 0
HEIFERS.	1. Robert Walker, Montbletten, Banff, .	2 10 0*
	2. Alexander Paterson, Mulben, Keith, .	1 10 0*

DRAUGHT-HORSES.

The County of Lanark.

STALLIONS.	Peter Crawford, Dumgoyack, Strathblane, .	L.25 0 0
MARES.	The Duke of Hamilton, ...	10 0 0
FILLIES.	John Findlay of Easterhill, Glasgow, . .	5 0 0

The County of Linlithgow.

STALLIONS.	James M'Artney, Royal Hotel, Dollar, .	L.25 0 0
MARES.	David M'Gibbon, Inveravon, Polmont, .	10 0 0
FILLIES.	Admiral Sir Jas. Hope of Carriden, Linlithgow,	5 0 0

The County of Edinburgh.

STALLIONS.	John Robertson, Mitchelston, Lochwinnoch,	L.25 0 0
MARES.	Alex. Naismith, Windlestrawlee, Edinburgh,	10 0 0
FILLIES.	James Laurie, Mitchelston, Stow, . . .	5 0 0

ENTIRE COLTS.

The County of Kincardine.

ONE-YEAR-OLD COLTS.	James Masson, Slateybaulk, Stonehaven,	L.2 0 0*

The District of the Perth, Fife, Kinross, and Clackmannan Association.

TWO-YEAR-OLD COLTS.	William Stirling of Keir, M.P., Dunblane, ...	L.6 0 0
ONE-YEAR-OLD COLTS.	Sir Thomas Moncrieffe of Moncrieffe, Bart.,	4 0 0

The Stewartry of Kirkcudbright.

ONE-YEAR-OLD COLTS.	W. & J. Shennan, Balig, Kirkcudbright,	L.2 0 0*

The District of Machars, in Wigtownshire.

TWO-YEAR-OLD COLTS.	James M'Connell, Low Glasnick, Newton Stewart, ...	L.3 0 0*
ONE-YEAR-OLD COLTS.	James Gifford, Grange of Bladnoch, Wigtown, ...	4 0 0

* Half Premiums awarded, the number of lots being under six.

CHEVIOT SHEEP.

The Districts of Gairloch and Lochbroom.

Tups.	David Mundell, Achindrean, Dingwall, .	L.5 0 0
Shearling Tups.	Walter Mundell, Inverlail, Dingwall, .	5 0 0
Ewes.	Allan Cameron, Torridon, Kinlochewe, .	5 0 0
Shearling Ewes.	Walter Mundell, Inverlail, Dingwall, .	2 0 0*

The District of Nithsdale.

Tups.	Alexander Nivison, Glencorse, Closeburn,	L.5 0 0
Ewes.	Robert Borland, Auchincairn, Closeburn, .	5 0 0
Shearling Ewes.	Wm. Borland, Townfoot, Closeburn, . .	4 0 0

The District of Annandale.

Tups.	John Carruthers, Kirkhill, Moffat, . .	Silver Medal.
Tups.	Thomas Brydon, Kinnelhead, Moffat, .	L.2 10 0*
Shearling Tups.	Thomas Brydon, Kinnelhead, Moffat, .	5 0 0
Ewes.	John Carruthers, Kirkhill, Moffat, . .	2 10 0*
Shearling Ewes.	Thomas Brydon, Kinnelhead, Moffat, .	2 0 0*

The Districts of Eskdale and Liddesdale.

Tups.	James Brydon, Moodlaw, Langholm, .	Silver Medal.
Tups.	James Brydon, Moodlaw, Langholm, .	L.5 0 0
Shearling Tups.	James Brydon, Moodlaw, Langholm, .	5 0 0
Ewes.	John Paterson, Terrona, Langholm, . .	5 0 0
Shearling Ewes.	W. G. Hunter, Dumfedling, Langholm, .	4 0 0

BLACKFACED SHEEP.

The Island of Arran.

Tups.	James Allan, Clauchan, Arran, . . .	L.5 0 0
Shearling Tups.	James Allan, Clauchan, Arran, . . .	5 0 0
Ewes.	Robert Crawford, Glenscorrodale, Arran, .	5 0 0
Shearling Ewes.	Robert Crawford, Glenscorrodale, Arran, .	4 0 0

The Upper Ward of Lanarkshire.

Tups.	Walter Johnstone, Longbedholm, Moffat, .	Silver Medal.
Tups.	James Greenshields, Westown, Lesmahagow,	L.5 0 0
Shearling Tups.	John Watson, Culterallers, Biggar, . .	5 0 0
Ewes.	Gavin Sandilands, Cumberhead, Lesmahagow,	2 10 0*
Shearling Ewes.	John Weddell, Hillend, Abington, . .	2 0 0*

The District of Argyll.

Tups.	John Malcolm of Poltalloch, Lochgilphead,	Silver Medal.
Tups.	James Campbell, Ormaig, Lochgilphead, .	L.5 0 0
Shearling Tups.	James M'Kechnie, Torran, Lochgilphead, .	2 10 0*
Ewes.	George Campbell, Ardifuir, Lochgilphead,	5 0 0
Shearling Ewes.	Robert Laurie, Fincharn, Lochgilphead, .	4 0 0

The District of Lochaber.

Tups.	Lord Abinger, Fort-William, ...	Silver Medal.
Tups.	Andrew Fraser, Carnisky, Fort-William, .	L.5 0 0
Shearling Tups.	Walter Reid, Glenfinnon, Fort-William, .	5 0 0

* Half Premiums awarded, the number of lots being under six.

SWINE.

The District of Alford.

BOARS.	1. Andrew Wilson, Whiteside, Forbes,	L.4	0	0
	2. George Reid, Culhay, Forbes,	2	0	0
SOWS.	1. Alexander Bruce, Waltheton, Keig,	3	0	0
	2. Andrew Wilson, Whiteside, Forbes,	1	0	0

DAIRY PRODUCE.

The County of Wigtown.

CURED BUTTER.	1. Andrew Wallace, Airies, Stranraer,	L.3	0	0
	2. Alexander M'Lelland, Balyett, Stranraer,	2	0	0
SWEET-MILK CHEESE.	1. John M'Camon, Barnhills, Stranraer,	3	0	0
	2. Alexander Ranken, Aird, Stranraer,	2	0	0

The County of Ayr.

CURED BUTTER.	C. D. Gairdner, Auchans House, Dundonald,	Silver Medal.		
CURED BUTTER.	1. Gavin Muir, Fingart, Dunlop,	L.3	0	0
	2. Robert M'Fadzean, Langside, Riccarton,	2	0	0
SWEET-MILK CHEESE.	1. James Wilson, Old Mill, New Cumnock (*under protest*),	3	0	0
	2. Alexander Young, Yonderton, West Kilbride,	2	0	0

The District of Nithsdale.

CURED BUTTER.	1. John Common, Craigenputtock, Dunscore,	L.3	0	0
	2. John M'Kie, Woodhead, Penpont,	2	0	0
SWEET-MILK CHEESE.	1. William Borland, Townfoot, Closeburn,	3	0	0
	2. H. D. B. Hyslop, Tower, Sanquhar,	2	0	0

The County of Lanark.

CURED BUTTER.	John Craig, of Ildston, Hamilton,	Silver Medal.		
CURED BUTTER.	1. Arthur Gilmour, Crosshill, East Kilbride,	L.3	0	0
	2. Andrew Aikenhead, Murray, East Kilbride,	2	0	0
SWEET-MILK CHEESE.	James Allan of West Mains, Stonehouse,	Silver Medal.		
SWEET-MILK CHEESE.	1. John Cochrane, Cleughearn, East Kilbride,	L.3	0	0
	2. James Fleming, Holm, Stonehouse,	2	0	0

SEED COMPETITIONS.

The Silver Medal has been awarded to the following:—

The District of Wester Ross.

William Allan, Dromanreach, Dingwall, for Red Straw White Wheat.

The District of the Black Isle.

Donald M'Kay, North Kessock, Inverness, for Chevalier Barley.
Patrick M'Lean, of Hawkhill, Fortrose, for Sandy Oats.

The County of Stirling.

Thomas Murdoch, Westwood, Stirling, for Sandy Oats.
John Blair, Clayhills, Stirling, for Common Barley.

The County of Ayr.

Captain Campbell of Craigie, Ayr, for Wheat (Archer's prolific).
Robert Montgomerie, Cockhill, Dundonald, for Oats (Tom Findlay).
John Drennan, Shaklehill, Tarbolton, for Perennial Rye-Grass Seed.

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Silver Medal has been awarded to the following :—

The District of the Royal Northern Society.

Silvester Campbell, Kinnellar, Aberdeen, for Shorthorn Bull.

The District of Deeside.

Lewis Strachan, Cluny Crighton, Banchory, for two Polled Heifers.

The County of Peebles.

Sir G. Graham Montgomery, Bart., M.P., for Shearling Cheviot Tup.

The Island of Arran.

John M'Kellar, Blairmore, for Sheep-Shearing.

The District of the Buchan Society.

Alex. Mien, Woodhead of Cairness, Cotes, for Shorthorn Bull.
Samuel Stewart, Sandhole, Fraserburgh, for Shorthorn Cow.

The District of the Spey, Avon, and Fiddochside Society.

Alexander Paterson, Mulben, Keith, for Polled Angus Bull.
Wm. Cantlie, Keithmore, Dufftown, for Shorthorn Heifer.

The District of the Kilmarnock Society.

William Barbour, Broomhill, Dundonald, for Ayrshire Bull.
David M'Houll, Kilmarnock, for Ayrshire Cow.

The Western District of Mid-Lothian.

John Meikle, Seafield, Mid-Calder, for Ayrshire Bull.
James Marr, jun., Adambrae, Mid-Calder, for Draught Mare.

The District of the Avondale Society.

J. R. Allison, Hillhead, Avondale, for Ayrshire Cow.
Andrew Hamilton, Drumclog, Avondale, for Ayrshire Bull.

The District of Wester Ross.

John Sharp, Kinnairdie, Dingwall, for Shorthorn Cow.

The District of Penicuik.

Andrew Pate, Fulford, Roslin, for Ayrshire Cow.

The District of the Black Isle Society.

Major James Wardlaw, Belmaduthy, Munlochy, for Highland Bull and Heifer

The District of the Fettercairn Club.

John Smith, Balmain, Fettercairn, for Shorthorn Bull.
Charles Durward, Eagle Inn Farm, Fettercairn, for best-managed Green Crop.

The District of the Mauchline Agricultural Society.

Wm. Lindsay, Killock, Mauchline, for Ayrshire Bull and Cow.

The District of the Mauchline Horticultural and Agricultural Society.

Hugh Miller, Grassmillees, Mauchline, for best-managed Dairy.

The County of Nairn.

Captain D. C. Cameron, Hillhead, Ardersier, for best-managed Farm.

The District of the Kincardineshire Club.

Robert Salmond, Nether Balfour of Durris, Stonehaven, for best-managed Farm.
Wm. Alexander, Bent of Haulkerton, Laurencekirk, for best-managed Green Crop.

The County of Inverness.

Robert Gentle, Dell, Gorthleck, for laid Cheviot Wool.
Robert Linton, Leadclune, Dores, for laid Highland Wool.

The District of the Leochel-Cushnie Association.

Samuel Dunn, Innenteer, Craigievar, for best-managed Green Crop.

COTTAGES AND GARDENS.

FOR THE BEST-KEPT COTTAGES AND GARDENS.

First Cottage Premium, L.1, 5s., and Medal when Four Competitors; Second, L.1; Third, 15s. First Garden Premium, L.1, 5s., and Medal when Four Competitors; Second, L.1; Third, 15s.

PARISH OF STRICHEN.—1st Cottage Premium and Medal, William Macdonald; 2d, William Linn; 3d, Alex. Urquhart. 1st Garden Premium and Medal, William Linn; 2d, Harry Emslie; 3d, Joseph Sim.

PARISH OF NEWBURGH AND ABDIE.—1st Garden Premium and Medal, George Moncrieff; 2d, James Robertson; 3d, Cecilia M'Laren, and James Edmeston.

PARISH OF LESMAHAGOW.—1st Garden Premium and Medal, James Faulds; 2d, John Fletcher; 3d, Robert Nichol.

PARISH OF DOUGLAS.—1st Garden Premium and Medal, James Gold; 2d, James Thomson; 3d, James Davidson.

PARISH OF WEST CALDER.—1st Cottage Premium and Medal, Alexander Martin; 2d, Robert Laurie; 3d, Mrs Miller. 1st Garden Premium and Medal, John Robb; 2d, Alexander Martin; 3d, David Steven.

PARISH OF STONEYKIRK.—1st Cottage Premium and Medal, Gilbert Graham; 2d, James M'Haig; 3d, John Borrowdale. 1st Garden Premium and Medal, Thomas Watkins; 2d, Gilbert Graham; 3d, Samuel Morrison.

PARISH OF KIRKCOLM.—1st Cottage Premium and Medal, Wm. Wright; 2d, David Frazer; 3d, Hugh Drynan.

MEDAL GIVEN IN AID OF PRIVATE COMPETITION.

THE LOGIEALMOND AND GLENALMOND HORTICULTURAL SOCIETY.—John Carmichael, for best-kept Cottage Garden.

VETERINARY COLLEGE.

Silver Medals were awarded, at the Annual Examination in April last, to the following parties:—

1. John Malcolm, Longsight, Manchester, for best General Examination.
2. William Pallin, Dublin, for second do.
3. William Worthington, Wrighton, Wigan, Lancashire, for best Examination in Horse Pathology.
4. B. R. Kirke, 1st Regiment United States Hussars, Trenton, New Jersey, for best Examination in Cattle Pathology.
5. William Worthington, Lancashire, for best Examination in Physiology and Histology.
6. William Worthington, Lancashire, for best Examination in Chemistry.
7. William Pallin, Dublin, for best Examination in Materia Medica.
8. William Pallin, Dublin, for best Anatomical Preparation.
9. William Worthington, Lancashire, for best Examination in Anatomy.

JN. HALL MAXWELL, *Secretary*.

EDINBURGH, *3d February* 1864.

PROCEEDINGS IN THE LABORATORY.

By Thomas Anderson, M.D., Professor of Chemistry in the University of Glasgow, and Chemist to the Society.

ON THE COMPOSITION OF SOME OF THE MORE IMPORTANT WEEDS INFESTING CULTIVATED SOILS.

The results which follow are a continuation of those which were commenced in the January number of the 'Transactions,' and do not therefore require any introductory observations.

Scentless Mayflower (*Matricaria inodora*).

The specimens were gathered on the 9th July, when the plant was in full flower. The soil was a strong clay.

Water,	77.14
Albuminous compounds,	1.28
Other organic matters,	20.45
Ash,	1.13
	100.00
Nitrogen,	0.206

The ash contained—

Peroxide of iron,	2.52
Lime,	19.54
Magnesia,	7.52
Potash,	23.66
Soda,	2.11
Chloride of sodium,	11.36
Phosphoric acid,	4.83
Sulphuric acid,	7.74
Silicic acid,	2.34
Carbonic acid,	11.78
Charcoal,	0.14
Sand,	5.67
	99.21

These results, recalculated after deduction of sand, charcoal, and carbonic acid, give—

Peroxide of iron,	3.08
Lime,	23.96
Magnesia,	9.23
Potash,	28.98
Soda,	2.58
Chloride of sodium,	13.92
Phosphoric acid,	5.91
Sulphuric acid,	9.48
Silicic acid,	2.86
	100.00

Groundsel (*Senecio vulgaris*).

The plants, which were of large size, were gathered on the 17th July. The soil in which they grew was stiff, and might be most correctly described as a clayey loam.

Water,	88.47
Albuminous compounds,	1.62
Other organic matters,	8.46
Ash,	1.45
	100.00
Nitrogen,	0.26

The ash contained—

Peroxide of iron,	1.99
Lime,	13.01
Magnesia,	5.40
Potash,	24.12
Soda,	6.50
Chloride of sodium,	16.01
Phosphoric acid,	6.17
Sulphuric acid,	5.11
Silicic acid,	2.49
Carbonic acid,	15.53
Charcoal,	1.11
Sand,	3.17
	100.61

After deducting sand, charcoal, and carbonic acid, the ash gave—

Peroxide of iron,	2.46
Lime,	16.11
Magnesia,	6.69
Potash,	29.85
Soda,	8.04
Chloride of sodium,	19.82
Phosphoric acid,	7.63
Sulphuric acid,	6.32
Silicic acid,	3.08
	100.00

Ragweed (*Senecio jacobea*).

The specimens were collected on the 20th July. The soil was a strong clay.

Water,	78.36
Albuminous compounds,	1.49
Other organic matters,	15.11
Ash,	5.04
	100.00
Nitrogen,	0.24

The ash contained—

Peroxide of iron,	2.34
Lime,	11.42
Magnesia,	3.59
Potash,	24.33
Chloride of potassium,	10.97
Chloride of sodium,	9.44
Phosphoric acid,	6.54
Sulphuric acid,	8.41
Silicic acid,	1.32
Carbonic acid,	17.11
Charcoal,	0.38
Sand,	3.67
	99.52

Sand, charcoal, and carbonic acid being deducted, this gives—

Peroxide of iron,	2.98
Lime,	14.57
Magnesia,	4.58
Potash,	31.07
Chloride of potassium,	13.99
Chloride of sodium,	12.05
Phosphoric acid,	8.34
Sulphuric acid,	10.74
Silicic acid,	1.68
	100.00

It is interesting to compare this plant with the preceding—both belonging to the same genus, and presenting many points of similarity in their botanical relations. Groundsel contains a considerably larger quantity of water than ragweed, as might indeed be anticipated from the more woody character of the stem of the latter plant. But the most remarkable difference is in the proportion of ash, which in ragweed is nearly four times as great as in groundsel. In this respect, indeed, ragweed surpasses any of the other weeds examined, and it indicates the importance of eradicating it from pasture-land, where its tendency is to lock up during the period of its growth a quantity of mineral matter which ought to be available for the more valuable grasses. The ash of both plants, and particularly of groundsel, is rich in common salt.

Common Sorrel (*Rumex acetosa*).

Plants collected on the 10th of June, from a stiff clay soil.

Water,	86.03
Albuminous compounds,	2.01
Other organic matters,	10.95
Ash,	1.01
	100.00
Nitrogen,	0.32

The ash contained—

Peroxide of iron,	2.96
Lime,	15.43
Magnesia,	8.04
Potash,	25.58
Chloride of potassium,	4.80
Chloride of sodium,	12.54
Phosphoric acid,	5.72
Sulphuric acid,	6.58
Silicic acid,	2.43
Carbonic acid,	11.59
Charcoal,	0.81
Sand,	3.08
	99.56

After deduction of sand, charcoal, and carbonic acid, the ash, calculated on 100 parts, gives—

Peroxide of iron,	3.52
Lime,	18.36
Magnesia,	9.56
Potash,	30.43
Chloride of potassium,	5.70
Chloride of sodium,	14.92
Phosphoric acid,	6.80
Sulphuric acid,	7.82
Silicic acid,	2.89
	100.00

Dock (*Rumex crispus*).

The plants, which were gathered on the 1st July, grew on a strong clay soil. The proportions of roots, stems, and leaves in the entire plants were determined, and found to be—

Roots,	17.33
Stems,	47.01
Leaves,	35.66
	100.00

The proportions of water, ash, nitrogenous compounds, and other organic matters, were determined in each of these parts of the plant; but for the ash analysis the entire plants were used.

	Roots.	Stems.	Leaves.
Water,	71.76	79.32	84.51
Albuminous compounds,	0.65	1.81	3.06
Other organic matters,	26.28	17.42	9.72
Ash,	1.31	1.45	2.71
	100.00	100.00	100.00
Nitrogen,	0.11	0.29	0.49

The ash of the entire plant contained—

Peroxide of iron,	2.24
Lime,	24.52
Magnesia,	9.70
Potash,	22.52
Soda,	1.20
Chloride of sodium,	9.77
Phosphoric acid,	2.60
Sulphuric acid,	3.97
Silicic acid,	3.60
Carbonic acid,	16.19
Charcoal,	0.24
Sand,	3.22
	99.77

After deducting sand, charcoal, and carbonic acid, this gives—

Peroxide of iron,	2.79
Lime,	30.65
Magnesia,	12.10
Potash,	28.11
Soda,	1.49
Chloride of sodium,	12.18
Phosphoric acid,	3.24
Sulphuric acid,	4.95
Silicic acid,	4.49
	100.00

The difference in composition of the root, stem, and leaves of this plant is interesting from the illustration it gives of the different proportions of albuminous compounds in those organs. In the roots the quantity is very small, but increases until in the leaves it is more than four times as large. Water and ash also increase, while the more nitrogenous organic matters decrease. This is due to the woody fibre, which is largest in the roots and smallest in the leaves. A comparison of this plant with that which precedes it, and belongs to the same genus, reveals some interesting points. Both are poor in phosphoric acid, more especially the dock; and lime and magnesia are abundant. The latter, indeed, is remarkably so, and the entire plant contains as much magnesia as the grain of wheat, which is usually considered to be richer in that element than any other plant.

Corn Marigold (*Chrysanthemum segetum*).

Collected on the 28th July. The plants were in full flower and well developed. They grew on a rich light mould.

Water,	76.10
Albuminons compounds,	2.31
Other organic matters,	19.73
Ash,	1.86
	100.00
Nitrogen,	0.37

The ash contained—

Peroxide of iron,	3.64
Lime,	16.21
Magnesia,	3.94
Potash,	23.46
Chloride of potassium,	2.98
Chloride of sodium,	14.59
Phosphoric acid,	6.72
Sulphuric acid,	6.99
Silicic acid,	3.38
Carbonic acid,	14.90
Charcoal,	0.12
Sand,	2.72
	99.65

Sand, charcoal, and carbonic acid being deducted, the ash gives—

Peroxide of iron,	4.44
Lime,	19.91
Magnesia,	4.81
Potash,	28.64
Chloride of potassium,	3.63
Chloride of sodium,	17.72
Phosphoric acid,	8.20
Sulphuric acid,	8.53
Silicic acid,	4.12
	100.00

Knapweed (*Centaurea nigra*).

The plants were collected on 28th July, and grew on a stiff clay soil. Owing to a mistake, the whole specimen of this plant was burned for ash before it was discovered that a part of the analysis had been omitted. I am, in this case, therefore, unable to give the exact percentage of ash.

Water,	70.56
Dry matter,	29.44
	100.00
Nitrogen,	...

The ash contained—

Peroxide of iron,	2.91
Lime,	16.80
Magnesia,	6.06
Potash,	21.34
Soda,	3.79
Chloride of sodium,	12.06
Phosphoric acid,	6.04
Sulphuric acid,	6.88
Silicic acid,	3.78
Carbonic acid,	11.90
Charcoal,	2.80
Sand,	5.28
	99.64

These numbers, recalculated without sand, charcoal, and carbonic acid, give—

Peroxide of iron,	3.66
Lime,	21.09
Magnesia,	7.61
Potash,	21.34
Soda,	3.79
Chloride of sodium,	12.06
Phosphoric acid,	7.58
Sulphuric acid,	8.63
Silicic acid,	4.74
	100.00

The analyses now given form the first instalment of a series, which it is my intention to extend by degrees until all the more important weeds have been examined. It would be premature to attempt any generalisation from the limited data hitherto obtained, but one or two points may at least be indicated. It is especially to be noticed that many of the plants contain a considerable quantity both of ash and of nitrogenous matters; and as far as the latter substances are concerned, some of them may bear comparison with the nutritive farm crops, such as potatoes and grass. They are, however, as we well know, rejected by animals, and consequently all the matters they contain are only so much of the elements which, under other circumstances, would be useful, locked up in a state in which they are for the present unserviceable. The farmer, therefore, will appreciate the confirmation which science gives to practice in regard to the importance of keeping down useless vegetation, and he will recognise the importance of doing this not only on arable but on pasture land. It is important, however, to notice that some discrimination is no doubt necessary in this respect, and that some apparently useless plants may really exercise a beneficial influence. The deep-rooted plants, like coltsfoot, may serve a good purpose by bringing up from the lower part of the soil substances which might otherwise be lost, and, by their decay, spreading them on the surface. Plants which perform this office it might be in some cases inadvisable to eradicate, but there can be no question about the advantage of getting rid of those which take their food from the superficial layers of the soil. But little support is given to the distinction into potash and lime plants; but, in the present state of our knowledge, it is impossible to arrive at any definite conclusions on this point.

On a future occasion I shall give the results of further investigations into this subject.

ON THE COMPOSITION OF AN EAST INDIAN OIL CAKE.

I have had occasion recently to examine a sample of linseed oil-

cake made in India, and of which a quantity has been imported into this country. It was in very small cakes, about nine inches long, three broad, and a quarter of an inch in thickness. Its appearance was very different from that of a cake made in this country, the seeds having been very imperfectly ground, and the pressure employed comparatively small. It was found to contain—

Water,	9.94
Oil,	14.76
Albuminous compounds,	28.06
Mucilage, gum, &c.,	28.02
Fibre,	13.31
Ash,	5.91
	100.00
Nitrogen,	4.49

The ash contained—

Phosphates,	2.01
Phosphoric acid combined with alkalies,	0.71
Sand,	1.24

A careful microscopic examination showed that it was entirely free from foreign seeds. It had therefore all the characters of a good oil-cake, rich in oil, and, so far as composition alone was concerned, would be described as decidedly above the average. It was found, however, to be extremely injurious to the animals which ate it, producing rather severe purging, which ceased when its use was discontinued, and reappeared when it was tried a second time, so that there could be no doubt that the effect was really due to the cake. No poisonous substances being present, it is difficult to account for the effects observed; but it appears to me that, in all probability, the cake had heated during the voyage home, and the oil contained in it had become rancid. The taste and smell of the cake were much the same as that of ordinary samples, and it had no acridity; but still it appears probable that this was the cause of its bad effects. An experienced oil-crusher, to whom it was shown, expressed a similar opinion regarding it. Since the analysis was made, attempts have been made to deprive the cake of its bad effects by boiling it, and also by regrinding and pressing a small quantity; but these have proved ineffectual, and it has been necessary to sell the remainder as a manure.

Several cases have at different times come under my notice in which cakes, otherwise satisfactory, have produced slight purging, for which I have been unable to account in a satisfactory manner; and there can be little doubt that the effect is due to the oil becoming rancid. It is possible that a change may sometimes occur in it similar to that observed in the fat of sausages and bacon, which have often been found (particularly in Germany) to produce very severe symptoms in man.

COMPOSITION OF KELP-SALT.

In the manufacture of potash, salts, and iodine from kelp, an impure common salt is deposited at a certain part of the evaporation. It always contains a certain proportion of carbonate of soda, and also some sulphate of potash, which latter substance is likely to make it useful as a manure. A sample of a very large quantity was found to contain—

Water,	17.15
Sulphate of potash,	6.66
Sulphate of soda,	10.40
Carbonate of soda,	14.50
Chloride of sodium,	51.09
Insoluble matter,	0.20
	100.00

A substance containing 6 per cent of sulphate of potash and 10 per cent of sulphate of soda merits a trial as a manure, and ought to be useful where a supply of alkaline salts is required. It may be noticed that the salt contains also 14 per cent of carbonate of soda, regarding the action of which on vegetation nothing is at present known. Although it is doubtful whether that substance would be of much use to the plant, it is reasonable to expect that it should at all events produce some effect on the soil, and promote the decomposition of some of the organic and mineral matters contained in it. An experiment with pure carbonate of soda would be of much interest, and it might easily be made at no great cost.

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1. BALANCE in the Royal Bank of Scotland at 30th Nov. 1862,			£1382 7 3
2. MEDALS on hand at do.,			26 16 0
3. ARREARS of Subscriptions at do. considered recoverable,		£202 12 0	
Whereof due by Members compounding for Life, and thereby extinguished,		23 1 0	
			179 11 0
4. INTEREST AND DIVIDENDS—			
1. Interest on £9500 lent on Heritable Security,		£367 13 7	
" On £5570 lent on Debenture Bonds,		215 8 8	
" On Bank Account,		16 7 6	
		599 9 9	
2. Dividends—			
On £12,070, 14s. 1d. of Bank Stocks (the value of which at 30th November 1863 is £23,690, 13s.),	£948 0 3		
On £500 Stock of British Fisheries Society,	20 0 0		
		968 0 3	
			1567 10 0
5. ANNUAL SUBSCRIPTIONS for the year,			884 13 0
6. LIFE SUBSCRIPTIONS,			1172 3 0
7. CHEMICAL DEPARTMENT—Annual Subscriptions,			126 17 6
8. LOCAL COMPETITIONS—Subscriptions in aid of,			37 12 6
9. KELSO SHOW, 1863—Receipts, per Abstract,			2893 19 9
10. PERTH SHOW, 1861—Contribution from Kinross-shire,			18 4 5
11. PRICE of Upper Storey of House, No. 7 Albyn Place, sold,			450 0 0
			£8739 14 5

EDINBURGH, 6th Jan. 1864.

Agricultural Society of Scotland, for the Year 1862-63.

Discharge.

1. Establishment—		
1. Secretary's Salary,		£500 0 0
2. Allowances for Heating, Cleaning, and Service,		83 5 0
3. Auditor's Fee,		30 0 0
4. Allowance to Editor of 'Transactions,'		42 0 0
5. Allowance to Editor of Veterinary Proceedings (half-year),		10 0 0
6. Clerks' Salaries,		167 15 0
7. Allowance to Curator of Machinery,		10 0 0
8. Feu-Duty, Taxes, Repairs, &c.—		
Feu-Duty,	£36 7 2	
Taxes,	30 1 7	
Insurance,	5 17 0	
Alterations and Repairs,	80 19 0	
		153 4 9
		£996 4 9
2. Chemical Department.—Salary to Professor Anderson,		300 0 0
3. Veterinary Department—		
1. Allowance to Professor Dick,	£26 5 0	
2. Medals awarded to Students,	7 4 0	
3. Advertising,	9 17 3	
		43 6 3
4. Museum—		
1. Feu-Duty, Taxes, Water-Duty, &c.,	£54 7 4	
2. Repairs,	34 3 7	
3. Gourlay Steell, for two Paintings of Animals,	64 0 0	
4. Wages to Porter,	39 0 0	
5. Coals,	5 4 0	
6. Model of Draining-Machine,	2 0 0	
		208 14 11
5. Premiums—		
1. For years prior to 1862,	£196 10 0	
2. For Essays and Reports,	106 12 0	
3. For Kelso Show, 1863,	804 4 0	
4. For Battersea Show, 1862,	311 16 0	
5. For District Competitions, 1862,	622 6 0	
		2041 8 0
6. Printing, Advertising, and Stationery—		
1. Printing,	£110 13 6	
2. Advertising,	19 0 8	
3. Stationery,	22 19 0	
		152 13 2
7. Price of £400 National Bank Stock purchased, at £205,		820 0 0
8. Miscellaneous Expenses—		
1. Grant for Illumination on occasion of Prince of Wales' Marriage,	£25 0 0	
2. Subscription to Meteorological Society,	5 0 0	
3. Expenses incurred by Mr Swan for Battersea Show,	28 3 0	
4. Coach-hires, Aberdeen Show, 1858,	5 0 0	
5. Agricultural Education—Examiners' Dinner,	8 0 0	
6. Seed Competition, Oct. 1861—Refreshments to Judges,	1 14 0	
7. Old Tree Returns—Fee to Mr M'Nab,	5 5 0	
8. Stirling Show—Use of Room for Meeting in Glasgow,	1 1 0	
9. Reporting General Meetings,	3 3 0	
10. Half Expense of Conveyance of Upper Storey, 7 Albyn Place,	4 12 3	
11. Expenses of purchase of £400 Stock, National Bank,	7 11 0	
12. Business Accounts,	4 4 11	
13. Postage and Receipt Stamps,	57 5 0	
14. Incidental Outlays, Travelling Expenses, Bank Charges, Herd Book, &c. &c.,	16 14 3	
		172 13 5
9. Kelso Show, 1863.—Expenses, per Abstract,		1951 3 11
10. Balance in Bank at 30th November 1863,		1722 16 6
11. Medals on hand at do.,		30 17 0
12. Arrears of Subscription—		
1. Recoverable Arrears,	£240 11 6	
2. Irrecoverable, and written off,	59 5 0	
		299 16 6
		£8739 14 5

JAMES W. HUNTER,................*Member of Finance Committee.*
ALEX. MACDUFF,....................*Do. do. do.*
KENNETH MACKENZIE, C.A.,.*Auditor.*

KELSO SHOW, 1863.

RECEIPTS.

1. LOCAL SUBSCRIPTIONS—			
1. Proprietors in Roxburghshire,	£400 0 0		
2. Proprietors in Berwickshire,	372 10 3		
3. Proprietors in Selkirkshire,	0 0 0		
4. Proprietors in Peeblesshire,	0 0 0		
5. Border Union Agricultural Society,	100 0 0		
		£872 10 3	
2. AMOUNT COLLECTED DURING SHOW—			
1. Drawn at Gates,	£1326 2 7		
2. Catalogues and Awards sold,	97 9 6		
		1423 12 1	
3. ENTRY-MONEY—			
1. On Stock,	£40 12 0		
2. On Implements,	14 0 6		
		54 12 6	
4. RENT OF STALLS AND SHEDDING—			
1. Rent of Stalls,	£224 18 0		
2. Implement Shedding,	96 7 6		
		321 5 6	
5. RENT OF REFRESHMENT BOOTH,		45 0 0	
6. RENT OF PARK,		170 0 0	
7. PROFIT ON BANQUET,		1 5 4	
8. INTEREST FROM BANKS,		5 14 1	
		£2893 19 9	

* Not yet reported.

EDINBURGH, *6th Jan.* 1864.

Abstract of Accounts.

Payments.

1. Premiums drawn at 30th November 1863,			£804 4 0
2. Show-Yard—			
	1. Contractor for fitting up Show-yard,	£1078 0 0	
	2. Proprietor of Park,	250 0 0	
	3. Bedding for Stock,	15 5 9	
	4. Water Fountains, Closets, and Troughs,	11 13 6	
	5. Refreshments for Judges, &c., in Yard,	13 15 9	
	6. Veterinary Inspector,	3 10 0	
	7. Miscellaneous Expenditure,	5 11 9	
			1377 16 9
3. Police Force,			23 18 5
4. Travelling Expenses of Judges, Secretary, Clerks, &c.,			69 10 6
5. Lodgings for Judges, Deputation of Directors, Secretary, &c.,			63 0 0
6. Hotel and other Bills for do. do.			31 1 3
7. Tickets to Banquet for Judges and Staff,			16 10 0
8. Printing—			
	1. Catalogues,	£92 3 0	
	2. List of Awards,	13 5 6	
	3. Placards,	20 0 0	
	4. Premium Lists, Certificates, Circulars, &c.,	49 1 0	
	5. Members' Tickets,	6 7 0	
			180 16 6
9. Advertising—			
	1. At Railway Stations,	£25 0 0	
	2. In Newspapers,	52 0 8	
			77 0 8
10. Allowance to Local Secretary,			21 0 0
11. Outlay by him,			0 12 0
12. Allowance to Curator of Machinery,			8 8 0
13. Clerks,			32 15 0
14. Assistants, Porters, and Attendants,			12 3 2
15. Postage Account,			26 18 6
16. Stationery,			3 6 10
17. Carriage of Boxes, Bank Charges, Telegrams, and Miscellaneous Expenditure,			6 6 4
18. Balance,			138 11 10
			£2893 19 9

JAMES W. HUNTER,..................*Member of Finance Committee.*
ALEX. MACDUFF, ...*Do. do. do.*
KENNETH MACKENZIE, C.A., ...*Auditor.*

STATE of the FUNDS of the HIGHLAND and AGRICULTURAL SOCIETY,

At 30th November 1863.

		£	s.	d.
I. INVESTMENTS—				
	1. Heritable Bond,	£9,500	0	0
	2. Bank Stocks, present value,	23,690	13	0
	3. Railway Debentures,	4,570	0	0
	4. Glasgow Water Corporation Debenture,	1,000	0	0
	5. Ten Shares, or £500, of the British Fishery Society,	200	0	0
		£38,960	13	0
II. HERITABLE PROPERTY, per Valuation,		7,037	18	5
III. BALANCE IN ROYAL BANK,		1,722	16	6
IV. MEDALS ON HAND,		30	17	0
V. ARREARS CONSIDERED RECOVERABLE,		240	11	6
		£47,992	16	5

ABSTRACT of the ACCOUNTS of the ARGYLL NAVAL FUND for 1863.

CHARGE.

1. Balance in Royal Bank of Scotland at 30th November 1862,	£454	18	9
2. Interest on £3000 Heritable Security,	116	2	2
3. Dividends on £1700 Debentures,	65	15	1
4. Progressive Interest on Bank Account,	9	0	3
	£645	16	3

DISCHARGE.

1. Allowance to two recipients,	£80	0	0
2. Balance in Royal Bank at 30th November 1863,	565	16	3
	£645	16	3

EDINBURGH, *6th Jan.* 1864.

KENNETH MACKENZIE, *Auditor.*

COMPARATIVE VALUE OF THE DIFFERENT GRASSES.

By Archibald Sturrock, Kilmarnock.

[Premium, £20.]

In these days of low prices for corn, and good prices for beef, wool, cheese, and butter—when many farmers consequently feel inclined to graze more and plough less—it appears to the writer that the subsequent descriptions and remarks on grasses, and on a few other herbage plants, along with several tables of mixtures of the seeds suitable for different soils and purposes, may be somewhat *apropos* to the times, and favourably received by cultivators. The intelligent farmer should not only know *how* to grow grass, but it is quite as requisite that he should know *what kinds* to grow so as to have good grass, and thereby obtain the best possible return for his labour and expenditure. Of late there have been discussions by our agricultural clubs all over the country on "the best means for improving pastures;" and, certainly, so far as rotation-grass is concerned, the first step to have *good pasture*, after the land has been thoroughly cleaned and manured, is a proper selection of *fresh clean seeds*, of the best species fitted for the special purpose and variety of soil, to sow down with. There is not much use in laying out money upon bones or other grass-manures to top-dress a lot of worthless grasses and weeds, as the herbage of only too many of our pasture-fields now consists of. Many farmers feel satisfied if they see their pasture-fields pretty rough on the surface, without considering that this roughness may be, and often is, owing to the greater portion of the herbage consisting of such unpalatable and innutritious species of plants that cattle will hardly eat them till nearly at starvation-point. If these species were absent, and their places occupied by better sorts, the pasture would be much more closely and evenly cropped.

In the west and south-west of Scotland, where the dairy system of husbandry is carried on so extensively, and where abundant pasture of the most nutritious quality is so essentially necessary, the importance of having a knowledge of the best species of herbage plants becomes great. Bearing in mind that over the greater part of the district mentioned, as well as in other districts, it is the grass-lands which pay the most of the rent and are the chief source of profit to the farmer, their comparative superiority ought to be a matter of the very first importance; and selecting the seeds of the best species for sowing down the land to grass deserves more skill and attention than what is really paid to it.

The large and important natural order of plants, named in the Jussieuan system *Gramineæ*, or *The Grasses*, comprehends in all

about 300 families or genera, and these are composed of nearly 4000 distinct members or species, forming about the twentieth part of the whole known vegetable kingdom. It ranks as the most valuable order of plants cultivable for economical purposes, especially as in yielding food in many different forms, either for man or beast; comprising, as it does, all the *corn*-producing plants (wheat, barley, oats, rice, &c.)—the great proportion of those which constitute *pasture* or are cultivated for *hay*—the best of the *sugar*-yielding species—with many others which abound in useful and fragrant juices, odours, &c.

The grasses of all plants are the most extensive in geographical range, being found in every part of the world. They form the highest zone of phanerogamous vegetation around the snow-clad summits of the loftiest mountains; and they are the last form of flowering plants to be met with—associated with the lichens and mosses—as we proceed in a horizontal direction towards either pole of the earth.

The native British *grasses*—taking that word in its popular and restricted sense as meaning the greater proportion of those plants which form the common and verdant covering of our pasture-lands and meadows—extend to, in all, 133 distinct species, and 72 permanent varieties of these; but only 94 of these species, along with varieties, grow indigenously in Scotland. The whole of these species are distinguished from one another, not only by obvious botanical characters, but also in their nutritive and economical values—hardiness, duration, habits and seasons of growth, and fondness for, or a dislike of, particular soils and localities.

The stem or "culm" is herbaceous, hollow but closed at the joints, bearing leaves with a split sheath through which the stem passes, and of only one season in duration; its height ranges from a few inches, as in sheep's fescue, up to 3, 4, and 6 feet, as in the Reed canary-grass and others. The *spikelets* or flowers are arranged in what are called *spikes, panicles,* and *racemes;* these spikelets consist of the *calyx,* and of either one, two, or many *florets.* The calyx, placed at the base of the spikelet, is composed usually of two *glumes*—rarely of one only, or entirely wanting. The florets have two *paleæ* or *pales*—the outer one the largest, which is often furnished from the summit, back, or base, with an awn of various length. The pales are so called from their encompassing the sexual parts, which, with but very few exceptions, consist of three *stamens* and two *styles* present in each floret, and consequently belonging to the class and order *Triandria digynia* of Linnæus. The composition of the *seeds* is chiefly *farinaceous.* All the species produce *radical* or *root leaves* in more or less quantity.

The great majority of the grasses, particularly such as form good pasture, have strong social or gregarious habits, and are liable to

pine and die out except when they grow in considerable admixture. The different species—it may be of the same botanical family, of the same natural habitat, and of much the same nutritive value—have very different seasons of leafing and of arriving at their maximum vigour of growth. It is to this property that the great superiority of old natural pasture, which is always composed of a considerable number of species, over artificial pastures—that is, pasture sown down with one or two species only—is chiefly owing.

The grasses which constitute the principal spring and summer herbage of the best natural pastures of Britain are the following:—meadow foxtail, meadow fescue, cocksfoot, ryegrass, oat-like soft-grass, sweet-scented vernal, and the annual and smooth-stalked meadow-grasses. Those which constitute the principal summer and autumn herbage of these pastures are:—rough-stalked meadow-grass, timothy, the hardish fescues, crested dogstail, yellow oat-grass, and woolly soft-grass. And those which grow most vigorously during the autumn months and well on into winter are, some species of wheat-grass and of the bent family. Of course, a portion of the herbage during the several periods of the year is composed of the perennial red, white, and yellow clovers, with a sprinkling of wild vetches, and during the autumn months, the milfoil or yarrow. Several other plants also—such as ribgrass or plantain, sorrel-dock, yellow buttercup or crowfoot, and the common daisy, &c.—always form a portion of the herbage in even the cleanest enclosures; but, not being nourishing ingredients, they can only be looked upon in a sense as pests and weeds, and are only eaten to any extent under a pressure of hunger through the exhaustion of the more nutritious grasses. The crowfoots (*Ranunculi*), in particular, are very prevalent in some pastures, completely overrunning the surface of the fields; and farmers cannot be too careful in seeing that the seeds of these are thoroughly cleaned out from amongst their grass seeds before sowing. A small proportion of some of these plants, however—such as crowfoot, yarrow, and sorrel—although in themselves too bitter to be eaten unmixed, may be useful to cattle when taken as condiments and astringents along with the nutritious but tasteless grasses—even as sheep are seen to eat and relish parsley and yarrow when sown in mixture with grass seeds upon a sheep-walk.

Every species of grass has its own peculiar habitat or natural place of growth. Some few, with strong creeping roots, grow and flourish upon the most barren soils, even on the loose sand-hillocks by the sea-shore; and they are very useful in forming a sward upon these, thereby preventing the drifting of the sand over the more inland arable lands. Some others, particularly the small and fine-leaved sorts, grow naturally and thrive upon elevated lands and hills, frequently as high as some 3000 feet or more above sea-level. These hardy grasses cover our hilly tracts of land with their fine and

nutritive herbage, affording a bite, during the most rigorous of our Scottish winters, to the many thousands of sheep and deer which have "the range of the mountains for their pasture." Other grasses again, unlike the preceding hardy and fine-leaved species, do not succeed when grown upon lofty and exposed situations, but come to perfection only in places where they are much sheltered, as in lanes and under the shade of trees. A few species are of very aquatic habits, and only flourish where they can luxuriate in a copious supply of their necessary element; the herbage of some of these is very sweet, and nourishing in a high degree. Our "moors and mosses many," likewise, have their own peculiar inhabitants, and these are generally of a harsh texture, with little foliage, and of the most innutritious nature.

Finally, on our low-lying, deep, rich pasture-lands and meadows, we find growing most of those superior species which have been already enumerated, as affording the principal herbage of the best natural pastures of Britain.

Thus we see how liberally Nature has provided grasses—and, of course, other plants as well—possessing such differences of habit and predilection as to make them suitable for covering, adorning, and rendering fruitful every variety and quality of soil.

RYEGRASS

(*Lolium perenne*, of the tribe *Hordeaceæ*).

Inflorescence spiked; spikelets arranged singly on each side of the rachis; calyx of one glume shorter than the spikelet, the terminal spikelet excepted, which has two glumes; florets not awned; root fibrous.

Natural grass simply means *natural pasturage*. But this term has come to be applied to all the other grasses in contradistinction to the ryegrass alone, on account of the latter having been so long solely used for sowing in arable land, and hence usually spoken of as one of the *artificial* or *sown grasses;* yet the ryegrass is as much a *natural* or native plant of Britain as any one of the other 133 species. It has been in cultivation for fully a hundred years, and that, too, almost exclusively, although there are many other native grass plants by much more bulky, more nutritious, every way more profitable, and every whit as well adapted for the alternate system of husbandry,—almost the only merit to which the ryegrass can lay claim being, the profuseness and regularity with which the plant produces and ripens its seeds, but which merit is shared to at least nearly equal extent by some other species much superior to it, such as cocksfoot-grass, rough-stalked meadow-grass, the tall and meadow fescue grasses, dogstail, &c.; and it is very questionable if such a property can be called a superiority in any plant used solely for herbage purposes.

The truest perennial ryegrasses, or those varieties whose roots are of the most permanent duration, are distinguished by yielding a greater abundance of root-leaves with fewer culms or stalks than those of shorter duration, known popularly as annual sorts, which produce a less quantity of root-leaves, and a greater proportion of stalks and seeds. The short-lived varieties, however, known as annual, are seldom less than of biennial growth, whilst the most permanent of the perennial varieties are liable to be degraded, by frequent seeding or other unfavourable circumstances, to a duration scarcely longer than of some real annual plants; and several varieties which have been introduced by experimental cultivators at different times, as yielding superior herbage and of more permanent duration, have been so changed in both characters and habits, through the influence of continual culture, mixture of seed, &c., as to have lost almost all traces of the favourable properties by which they were originally distinguished.

The less permanent, or the so-called annual sorts, are commonly supposed to yield a larger bulk of grass in the first year, on account of the greater number and length of their stalks, and are therefore considered by many farmers as being the best kinds to sow for single crops of hay; but the larger quantity of root-leaves and stem-foliage which the more permanent sorts produce, fully compensates for any deficiency arising from the less weight of the culms, and the hay is also less wiry and more palatable.

No exact means exist of distinguishing the annual or biennial varieties from those of longer duration by their seeds alone. The correct course, therefore, for farmers to pursue, when desirous of having ryegrass of more than biennial growth, is to sow only such seed as has been saved from strong close-set healthy plants, of *at least* two years' standing—that is, plants whose roots are two and a half years old from time of sowing; and, when purposing to preserve the seeds of a few acres as above, the first year's grass should either be cut down when very green, or grazed off with stock.

At present, ryegrass seed is quoted and sold, according to the different weights per bushel, under some such mode as follows:—seed weighing 20 to 24 lb. as annual and inferior perennial; 24 to 26 lb. as good perennial; and all weights upwards of 26 lb. as fine and extra fine perennial; the merchants and others appearing to look upon these ryegrass seeds as if they were *grain*, intended to be ground into flour (pricing the seeds the higher, the greater the weight of flour contained in them), and not as if the seeds were intended for their true and only use, meantime at least—viz., for sowing to produce *good, permanent*, herbage plants.

The present nomenclature, then, of ryegrass seeds in the merchant's seed-lists is wrong. Different kinds of soils, no doubt, have some effect in producing heavier or lighter seeds; sandy loams tending to raise larger and usually leaner seeds, and clays the reverse;

but, as a general rule, the seeds weighing from 20 to 24 or 25 lb. may be taken as the most perennial, whilst those from 25 to 30 lb. are the sub-perennial, biennial, or annual. The error of misnaming the lighter and heavier seeds respectively, probably has arisen from the merchants purchasing the seeds as if they were cereal grain, and intended for a like purpose, with little or no reference to the after-grass of the fields from off which the seeds were saved; the heaviest seeds thus being the highest priced, and the perennial ryegrass bearing a higher character in the market than those varieties of shorter or annual duration, it was natural for the merchants, when again offering their seeds for sale, to quote those which cost them the most money by the name of that variety which stood highest in the estimation of most farmers.

Very small ryegrass seeds, weighing from 32 to 34 and even 36 lb. per bushel—being simply the cleaned *siftings* from out the great body of the ryegrass—are quoted and sold under the title of *super* or *extra fine perennial.* They are certainly *extra fine* if the *size* of the seeds be only taken into account; but with regard to the plants raised from them it is quite the reverse,—these very small seeds being in great part the produce of a starved, stunted variety, named by botanists *L. perenne tenue*, and a most wretched *attenuated*-looking thing it is—a short starved stem, ditto spike and spikelets, with little or no foliage, and still less root-leaves.

Farmers might often save money by purchasing their ryegrass seeds about 22 lb. per bushel quality, or even less, and they would have better grass plants from such than from fine short heavy seed at a much higher figure; bearing always in mind, whatever may be the weight of the seed, that it be fresh and thoroughly cleaned. Even more, putting aside altogether the inferior sort of plants produced, the greater number of individual seeds in the bushel of the short heavy quality does not compensate in sowing more land for the difference in price. To sow the finest and heaviest seeds of the cereals is right enough, but recollect that the cereals are cultivated chiefly for their seeds, their straw being a very subordinate matter.

Some twenty years ago, the average weight per bushel of ryegrass seed in the west of Scotland was fully 6 lb. less than what it is now, and this fact is a sure proof of the deterioration of the ryegrass plant in permanency of growth. It would be well if our agricultural societies would consider that the ryegrass plant does not require any fostering care, it being already by much too exclusively cultivated; and that, by encouraging the rearing and bringing up of its seeds to nearly if not altogether as heavy a weight as oats, the usefulness of the mother plant as an herbage and forage grass has been considerably deteriorated. Prizes are offered for the best *perennial*, but they are universally adjudged (allowing other conditions—as freshness, colour, and freeness from extraneous seeds—to be equal) to the *finest* and *heaviest quality* of seeds, which *are not* the

best *perennial*, but on the contrary *are such* as raise plants the nearest approaching to an *annual* duration. Let the societies give prizes to the grower of the best 4 bushels of cocksfoot, or of meadow fescue, or of rough-stalked meadow-grass, or the best 1 cwt. of timothy, or suchlike, and a good, useful, practical end will be served; but the prizes at present given for ryegrass seeds, in the writer's opinion at least, would do more good by being entirely withdrawn.

Although still going under the name of perennial, the ryegrass ought truly now to be called sub-perennial, or even biennial, for in reality the great proportion of it at the present time is nothing more. It may, very likely, long continue to occupy the vantage-ground which it now holds as an herbage and forage plant, custom being all-powerful with many farmers; however, it cannot be gainsaid that we possess, in several species of the grasses, plants which rank much superior to it, either for hay or pasturage; and, if some of our more intelligent farmers would devote a little of their spare energy to the introduction of these superior sorts by cultivating a few of the best kinds and preserving the seeds themselves, so as *their seeds might be had of fresher quality and at a lower figure*, we might and would soon see a change for the better in the appearance of most of our grass fields.

In the present state of the trade in natural grass seeds, it is next to impossible for a farmer to procure these of clean, new, and fresh quality, through dealers. The average price of the eight natural grasses—the best adapted for general purposes—is about 9d. per lb., whilst that of the ryegrass may be put down at 2d. per lb.; and this itself is one very particular reason why the ryegrass is so exclusively cultivated. Though it ought to be borne in mind that, owing to the size and weight of the individual seeds, a pound of cocksfoot, poa trivialis, timothy, dogstail, &c., comprises a vastly greater number of seeds than a pound of ryegrass, which lowers their prices considerably in comparison, as a much less weight of the kinds noted and others, than of the ryegrass, is necessary to sow out an acre of land. The seeds of a few species, doubtless, will never be had at a very low price, from the irregularity with which they ripen; but others, and these, too, being those usually recommended for agricultural purposes, might be had, to say no more, at a greatly less figure than what they are at present.

VARIETIES OF THE RYEGRASS.

There have been introduced at various times, by experimental cultivators, several so-called varieties of the ryegrass—such as Pacey's, Whitworth's, Stickney's, Russell's, Pollexfen's, Devonshire, &c.—which originally, perhaps, were distinguished by some superiority in abundance of foliage, manner and time of growth, hardiness and duration, or other properties; but all of such varieties are much liable to sport and become changed in growth and habits, as pre-

viously explained. Whenever the extra attention required in selecting and keeping the variety pure is given up or even partly abated, and the variety left to make its own way and take its chance of adverse soils and culture, mixture of seeds, &c., it very soon deteriorates and falls back to a common mediocrity. Considerable quantities of ryegrass seeds are still sent out under the title of Pacey's perennial. The original Pacey's ryegrass was noted for its abundance of long and broad root-leaves, sending up comparatively few culms topped by rather short spikes—in fact, just a real *true perennial* ryegrass; but the seeds now usually sent out under this name are simply selected parcels of fine regular-sized and generally *heavy-weighted* seed, growing plants the very reverse of the original Pacey's—a great abundance of bare stalks with large spikes, and few or no root-leaves at all. As for their Stickney's, Whitworth's, and others, the writer has tried many samples procured from different quarters, and never could discover in the produce any superior properties or material difference worth notice when compared with the common ryegrass in cultivation. These *variety names* are the means sometimes of putting a few shillings extra into the merchant's pocket, and that, now, at least, appears to the writer to be the chief property possessed by any of them; and a useful property it is *to the merchant*. The principal points to be aimed at in good ryegrass plants are, undoubtedly, the greatest abundance of large root-leaves, and as few culms as possible, well furnished with broad foliage; and the best and only way to get into a stock of these is, by sowing seed preserved from vigorous two or three-year-old-rooted plants, taking the seed off the plant when it is fully filled and just begun to ripen, and not allowing it to stand till dead ripe or overly matured.

RYEGRASS-SEED-SAVING AS A CROP IN THE ROTATION.

The system of preserving the seed of the ryegrass as a regularly-recurrent crop in the rotation is carried on very extensively in the west and south-west of Scotland, and within these few years back it has been extending into other districts, especially in the north-east of Ireland.

The great majority of the seed-raisers are engaged in the dairy husbandry, and one would naturally think that the comparative superiority of their pastures should have the first claim on their attention; but, owing to this seed-saving system which they carry on, they are prevented from sowing the seeds of the clovers in such proportion to the grass-seed as ought to be the case, and on this account, for one cause, the produce and nutritious quality of their pasture-grass is very inferior, besides the thrashed hay being nothing but a mass of hard, wiry, unpalatable stalks. The average quantity of clover sown by seed-raisers does not exceed 3 lb. per acre or even rather less, and along with this is sown about two

bushels of heavy ryegrass; whereas, in the east country and elsewhere, the average proportion of clover, either for hay and grazing, or two or three years' grazing alone, amounts to at least from 12 to 14 lb. per acre.

It would be well if the seed-raisers would consider whether the sum of ready money which they get in hand for their grass-seed—high-priced even as that seed is when compared with their wheat or oats—does at all nearly compensate them for the ultimate loss caused by the deterioration of the soil, the low price of their thrashed ryegrass hay, as well as the deficient weight per acre, and particularly the decreased productive powers of the two or more years' wretched grass which is obtained after the first year's hay-crop being allowed to stand uncut and fully ripen out the seeds.

If farmers will give a preference to the ryegrass over other superior species, and determine on its exclusive cultivation, by all means let even it, inferior though it be, have at least a fair chance; but a fair chance to produce good pasture it certainly does not get, when, by taking from the plants in the earliest stage of their growth a heavy crop of seed, the young roots are so much weakened that, in a very short time thereafter, the great majority of them die out entirely, their places being soon filled up by crowfoots and other weeds. The seed-raiser, by cultivating the ryegrass for its seeds, and doing everything in his power to procure a bulky crop of heavy seed off the plants, is gradually degrading it from a useful perennial into a very inferior annual, growing much less herbage and foliage with more stems and heavier seeds. Frequent heavy seeding of any grass tends to produce that effect; they in course of time become so much weakened that they die from the exhaustion.

In the county of Ayr alone, with which the writer is more intimately connected, there is annually preserved some 300,000 bushels of ryegrass-seed, which is exported to all parts of the kingdom, as well as to the Continent.

The exorbitant prices given for ryegrass-seeds these few years back is a great inducement to continue its culture. No wonder that the raising of ryegrass-seeds is made a regular trade of, when some 210 lb. of these fetch 30s., and only 17s. 6d. can be got for equal weight of oats, or 21s. for equal weight of wheat; seeing, at the same time, to the writer's own knowledge, that there are now many lands in Ayrshire, off the acre of which the farmer has as great a weight of ryegrass-seeds as what he has of the long oats, common in that county. Oats and the other cereals are only monstrous species of grasses. A bushel of 28-lb. ryegrass may turn out as much flour, possibly as nutritious, as what a bushel of 28 or 30 lb. long oats will; but we find the ryegrass-seed fetches 1s. 3d. per bushel extra money.

The heavy-weight qualities of ryegrass-seeds are the worst for growing good pasture plants.

ITALIAN RYEGRASS
(*Lolium perenne*, var. *italicum*).

Florets furnished with slender awns; glume considerably shorter than the spikelet; root fibrous.

The Italian, at its first introduction into this country nearly thirty years ago, was generally regarded as a distinct species, but is now placed by the best botanists as only a wide variety of the common ryegrass. It is characterised in having taller culms, and of a more tillering habit, several springing from the same root; has more abundant foliage, broader, and usually of a lighter-green colour; longer spikes, with more thinly-set spikelets; the spikelets also longer, containing more seeds, from most of which being awned, they are lighter per bushel than those of common ryegrass. It arrives much sooner at maturity than the common ryegrass, is greatly preferred by cattle, and greedily eaten by them, whether in a green state or when made into hay. It has been generally considered at most a biennial plant; yet, if cut down when green, or before coming into flower, it is found to continue for several years in duration.

The plants of the Italian ryegrass, like those of the common species, differ sometimes very much from one another. A kind known as short-awned Italian (*L. perenne*, var. *submuticum*) has thicker stems of a rather more spreading habit, and which, along with the foliage, are of a darker colour; and the seeds have a comparatively short awn—fully one-eighth of an inch or so. This variety, for long thought more or less spurious, is now considered the best; being found superior in productiveness and nutritiousness to the more common tall thin sort, with pale-coloured stem and leaves, and producing seeds with long tail-like awns.

In purchasing seeds of the Italian, the awn, certainly, is the best criterion of its genuineness; but, even though there be a *small* proportion of awnless seeds, the samples must not therefore always be looked upon as adulterated; there being in many spikelets sometimes two or three seeds without awns, and the lowermost seed of each spikelet being very frequently bare. Seeds of the Italian are frequently much mixed with those of the barren fescue (known as "hairgrass" seeds), and their separation is rather difficult; it can only be thoroughly effected by a peculiar wire-sieved machine. Foreign Italian also, as imported, is in most cases very foul with weed-seeds of all kinds, and should never be sown till thoroughly cleaned.

The Italian ryegrass, these few years back, has been getting into more favour, and gaining ground rapidly upon the common species, and is now included by all intelligent cultivators as an ingredient in their mixtures, either for green-cutting or grazing purposes. Its special one great advantage is the rapidity of its growth, through which property it is eminently adapted by itself for one year's grass

or hay; and when sown in mixture with clover-seeds, a smaller proportion is recommended than that usual with the common species, as from its rapid growth, if too thick, the young clover plants are liable to be choked and killed.

To grow the Italian ryegrass in anything like perfection, the land must be in a high state of fertility. It is a plant which can stand any amount of manure, and hence its pre-eminent value when liquid manure is available; under such a system of treatment the stems will grow to a height of from 4 to 5 feet.

Specimens of a branching variety of Italian (*L. perenne*, var. *ramosum*) are frequently to be met with. This is a tall grower, and were it but constant in its form, would yield a much larger crop of seed than the common variety. It throws out three or four lateral branches at the base of the spike, bearing commonly four spikelets each.

There are some species of our native grasses which possibly might yield for a first cut an even greater bulk of produce than the Italian ryegrass, if cultivated under the same treatment of a continuous application of liquid manure—such as tall fertile fescue, broad-leaved bearded fescue, and tall oat-like soft-grass; but whether they would be as nutritious for feeding purposes is questionable; they are not so succulent, and they want that great quickness of growth to bring them rapidly forward for a second and third cut.

Home-saved Italian now weighs about 17 to 18 lb. per bushel, and is retailed at from 5s. to 5s. 6d. Imported seed is sold by the cwt. at from 40s. to 50s.

BEARDED RYEGRASS OR DARNEL
(*Lolium temulentum*, of the tribe *Hordeaceæ*).

Florets awned; glume of equal length, often longer than the spikelet; root fibrous, and annual.

This is the only other distinct species in the genus *Lolium* to be found growing indigenous in Britain. Although not very common in Scotland and Ireland, it is more frequently to be met with in England, and must be very common in some parts of the Continent, as its seeds are often found plentifully intermixed in samples of foreign grain. It is a most pernicious weed; the whole plant, but particularly the seeds, being of a poisonous nature.

Some varieties of the bearded or poisonous ryegrass, especially in their young state, bear a very considerable resemblance to the Italian variety of the common species; but they are easily distinguished by the *glume* being always *as long* or longer *than the spikelet*—and sometimes having also a *very short thin inner glume*—the spikelets, besides, being composed of fewer florets, never exceeding four or five. The whole plant is of a stiff, upright habit of growth, and is known also in some districts under the name of *Doites*.

The seeds of the darnel, when dead ripe, are short and plump,

approaching very near in form to those of wheat, and weighing nearly 40 lb. per bushel. The darnel being a *true annual*, this should in itself tend to confute the present rage of farmers for purchasing only the shortest and heaviest ryegrass-seeds, as being the best perennial.

MEADOW CATSTAIL OR TIMOTHY GRASS

(*Phleum pratense*, of the tribe *Alopecuroideæ*).

Inflorescence panicled; panicle erect, of a close, cylindrical, spike-like form; spikelets small and numerous, of one floret, on very short footstalks, all around the central branch; calyx of two equal glumes, each terminating in a short stout awn about half the length of the glume, and the keels or midribs of the glumes fringed with white hairs.

Timothy or meadow catstail is one of our best native grasses, and is common throughout the whole of Britain. It has been for many years cultivated in this country, and held in pretty high estimation, particularly in clayish-soil districts, and much more extensively, almost exclusively, in cultivation throughout Canada and the Northern States of America. The root is perennial, fibrous, but *somewhat creeping*, and on dry lightish soils often inclining to a bulbous form. The stem grows from 2 to 4 feet in height, is erect, round, and smooth, and the leaves are broad and flat, and roughish on both surfaces. Timothy is best adapted for *moist clay* or *carse lands*, and it also thrives very well upon improved *grey, moorish, and peaty soils*. On such soils, or even on all soils *above a medium in strength*, timothy should always form a proportion of the grass-seed mixture when pasture is intended; on soils *under a medium* it is of much less value. Timothy may be said to be chiefly valuable—barring special soils and purposes—as a grazing or pasture grass; its aftermath, unlike that of cocksfoot and some others of our best grasses, being of rather slow growth, and consequently yielding but a middling second cut of hay; but yet the aftergrass, although comparatively scanty, continues equally as nutritious as the first or flowering crop, which is not the case with the other superior grasses. Timothy is deficient in comparison with some others as an *early* spring grass, but is about equal at least in this respect to the common ryegrass, and much superior to it in some other properties—specially feeding quality. It has a higher limit of altitude than the three other superior grasses along with which it ranks—viz., cocksfoot, meadow fescue, and rough-stalked meadow-grass—being found growing about 1500 feet above sea-level, and consequently should be better suited for sowing on very high cultivated arable lands. The seeds of timothy ripen from the end of July till the first and second weeks of August.

The name "Timothy" is derived from Mr Timothy Hanson, an American, who was the first to bring this grass prominently into notice, upwards of eighty years ago. Its more proper name, "Cats-

tail," is from the resemblance in form of its close cylindrical panicle or ear to the tail of a cat.

Phleum nodosum, or *P. pratense*, var. *longiciliatum*—a separate species with some botanists, but now generally placed as merely a variety of *P. pratense*—with *bulbous roots*. It seldom reaches more than a foot in height, the lower part of the stem being of a prostrate habit, and bent at the joints, and is usually found growing on barren sandy places; the hairs on the mid-ribs of the glumes are longer than in the normal plant, hence the term *longiciliatum*. Another variety, the *P. pratense*, var. *longiaristatum*, long-awned timothy grass, is known by the awns of the glumes being *as long as the glumes* themselves, and the *root* being also *bulbous;* in other respects it is similar to *P. pratense*, although frequently its ear is not more than half an inch in length, and then it much resembles *P. alpinum*, noticed below. These two varieties, which are both later grasses, along with five other distinct species, natives of Britain—viz., *P. alpinum*, *P. michelii*, *P. arenarium*, *P. asparum*, and *P. Boehmeri*—are but of very little, if any, agricultural value. The four latter species are of very rare occurrence, and confined mostly to England; the remaining species, *P. alpinum*, is exclusively a native of Scotland, and is found frequently growing in moist situations, at a very high elevation, on several of our Highland mountains. This mountain catstail is seemingly considerably relished by sheep. It seldom exceeds a height of from 6 inches to a foot, and is easily distinguished by its short oval-shaped bristly panicle, which is commonly under an inch in length, and the awns being nearly as long as the glumes.

The panicle or ear of the *cultivated P. pratense* should always range from 2 to 4 or 5 inches in length; if not so, it is liable to suspicion that the seed sown has not been thoroughly pure. The best quality of timothy-seeds retail on an average about 6d. per pound.

MEADOW FESCUE GRASS.

(*Festuca pratense*, of the tribe *Festucaceæ*).

Inflorescence simple panicled, the topmost four or five spikelets arising directly from the rachis, the lower spikelets on lateral branches, and the whole panicle slightly leaning to one side; spikelets of a sharp ovate form, and of 5 or 6 florets; uppermost ligule very short, obtuse, and decurrent on one side; root-leaves broad and flat, and of a lively green.

This grass is a perennial and fibrous-rooted native of Britain, and a large ingredient in the herbage of all our best irrigated meadows and most nourishing natural pastures. It grows to a height of from 18 inches to 2½ feet, and thrives best on rich and *rather moist* soils, but it is suited for and succeeds well enough on all average good land, and is much relished by every description of live stock; besides, it has not the tufty habit of growth which some of the

other large grasses possess. It may be considered one of our best grasses for permanent pasture on a great variety of soils, and is also well adapted either for hay crops or pasture in alternate husbandry, especially when combined with the cocksfoot-grass, rough-stalked meadow-grass, and ryegrass. The meadow fescue is most probably only a variety of the tall fertile fescue (*F. elatior*), the only difference between them being—excepting size—that the panicle of the former is simple, whilst that of the latter is compound. Along with the cocksfoot-grass it ranks next to the meadow foxtail, amongst the superior grasses, in regard to early produce in the spring.

The *broad root-leaves* of the meadow fescue, which are produced in very considerable quantity, are tender and succulent, much liked by cattle, and form very nutritious pasturage, as an instance of which it may be noted that, throughout the rich grazing district of the Vale of Aylesbury, the herbage of the most fattening pastures therein is in great portion composed of this grass. The meadow fescue flowers about the end of June, and ripens its seeds towards the end of July; and it contains much more nutritive matter at the time of flowering than when the seeds are ripe.

The four species of Festuca—*F. pratense, F. elatior, F. loliacea,* and *F. gigantea*—are now placed by modern botanists in a new family, viz. Bucetum, as they differ widely in some of their characters from the true festuca. Their root-leaves are broader than those of the stem, and the awn (when present) arises from *behind the summit* of the outer pale; whereas, in the true festuca, the root-leaves are narrower than those of the stem, and the awn *always* arises from the *extreme summit* of the outer pale. However, to prevent confusion, the old name is here given, as the seeds are still quoted under that name in all seed catalogues. Present retail price of meadow fescue seeds, about 8d. per pound.

COCKSFOOT GRASS

(*Dactylis glomerata*, of the tribe *Festucaceæ*), better known in America as *Orchard-grass.*

Inflorescence panicled; panicle one-sided; spikelets in dense globular tufts, and crowded on short footstalks; outer pale of the floret or seed with a minute point or awn; stem stout, striated, roughish, and sheathed at bottom by the root-leaves: leaves broad, rather harsh to the feel, and usually of a dull glaucous-green colour; root perennial and fibrous.

Cocksfoot is probably the best known and most productive and valuable of our indigenous grasses. It grows naturally to a height of from 2 to 2½ feet, and produces an immense quantity of nutritious root-leaves and foliage. Its only fault is, that its habit of growth is tufty, which gives a somewhat unsightly appearance to pasture-land. It is not, however, so liable to get tufty when combined with other grasses; more so when grown

for hay by itself. Cocksfoot soon arrives at its full productive powers from time of sowing, and yields an extremely large bulk of hay, reproducing its herbage also very rapidly after being cut; in fact, it is the most rapid grower of all our native grasses—the meadow foxtail and oat-like soft-grass ranking next in this respect. It is well adapted to sow, either for hay or grazing, in any course of rotation whatever. When kept low by grazing, it is a most valuable grass in pasture for the first four or five years, as after that time it seems to die out if constantly depastured by cattle, more so if by sheep, and gives place to the smaller finer-leaved sorts.

The cocksfoot lives and thrives best on a medium loamy soil, giving a rather meagre return when grown upon very stiff clays or light sands. It is exceedingly luxuriant when growing in deep moist soils under the shade of trees. When grown upon a fertile loam, with a free porous subsoil, into which its fibrous roots can penetrate to some depth, it then becomes productive in an extraordinary degree; but, if grown upon a thin surface soil with a stiffish subsoil, the produce is much less, and the plants are also liable to be drawn out of the ground by the cattle when grazing, owing to the slender hold which the roots can take. The cocksfoot-grass is found to compose, in large proportion, the herbage of some of the most famed pastures in Devonshire, Lincolnshire, &c.; it yields a weight of hay much greater than that of the ryegrass, and its hay is also much superior in nourishing properties, and contains most nutritive matter when the seeds are ripe. Although coming into flower partly as early as the middle of June, it is usually the very end of July or beginning of August before the seeds are properly matured, and, on this account, the crops of it *for seeding* are often mown much too early. Irish-saved seed, in particular, is frequently very inferior in growing quality, weighing only 8 to 10 lb. per bushel, and is dear at any price; good English, or otherwhere-grown seed of 12 to 14 lb. quality, rates at from 6d. to 7d. per lb.

A few exotic species of the *Dactylis* family have been introduced, but they are of interest only to the botanist, being quite worthless in an agricultural sense. One species, called tussac-grass (*Dactylis cœspitosa*), was introduced from the Falkland Islands in 1844. It created some sensation at the time, but little has been heard of it since.

ROUGH-STALKED MEADOW-GRASS

(*Poa trivialis*, of the tribe *Poaceæ*).

Inflorescence, panicled, branching and spreading equally on all sides; florets and seeds downy—*i. e.*, furnished at the base with a fine web of hairs; stem and sheaths roughish when felt from beneath upwards; the uppermost sheath crowned with a *long-pointed ligule,* and much longer than its leaf.

This is a very common native of moist meadows and pastures, and has a height of 18 inches to 2 feet. Its root is perennial,

fibrous, but very slightly creeping; and shoots are produced from the root at the base of the culms, which trail on the ground and send down small roots at their joints in moist weather. These rooting shoots begin to grow pretty early in spring, but become dried if exposed to the effects of much sunshine during summer; they however shoot out again towards the end of the season, when the weather becomes more moist, and continue green during the greater part of winter. This habit of growth fits it admirably for growing in mixture with the more upright sorts of grasses, such as Italian ryegrass, meadow fescue, &c. When grown by itself, and especially if on dry exposed situations, the produce of this grass is nothing to brag of; but when grown in combination with other grasses—and taking into account its highly nutritive qualities, as shown, besides analysation, by the marked partiality which oxen, horses, and sheep have for it, and also the seasons in which it arrives at perfection, or rather its habit of early and late growth—it may be distinguished as the most valuable of those grasses which affect moist, rich soils, and sheltered situations. Upon the whole, *Poa trivialis,* when sown upon good land, and *in mixture with a number of other herbage plants,* may be considered one of our best grasses for either pasturage or hay. This species blooms from June till August, ripens its seeds from the middle till end of July, and contains most nutritive matter when the seeds are ripe. It yields a greater bulk of hay than the ryegrass, and by analysis is also superior to it in nutritive elements in the proportion of five to four. The price of its seeds at present ranges from 10d. to 1s. per lb.

The meadow grasses or *Poa* family include, in all, twenty-two native species, with several varieties of these; only four of these species, however, merit much attention from having properties fitting them for agricultural purposes—viz., *P. trivialis, P. nemoralis, P. fluitans,* and *P. pratensis.* The three former are noticed separately; the latter, *P. pratensis,* creeping or smooth-stalked meadow-grass, is an earlier grass than the *P. trivialis,* producing a considerable quantity of very early herbage, much liked by all cattle; it is not, however, recommended for general cultivation on account of its long *creeping roots,* which much impoverish the soil, and from its herbage in a great measure ceasing to grow so soon as the seeds begin to ripen. The natural habitats of *P. pratensis* being very dry gravelly spots of soil, it may be sown to good advantage in a mixture for either hay or pasture on *light sands,* or, indeed, on all lands of so light a nature as upon which the fibrous-rooted grasses will not succeed. *P. pratensis* is distinguished from *P. trivialis,* not only by its creeping roots, but in the panicle being smaller and more open, and the whole plant usually of less size, the *sheaths* being mostly *smooth,* and the *ligule* of the sheath being *short* and *obtuse.* The *ligule* is a white skin-like membrane at the base of the leaf, attached to the end of the sheath, and embracing the stem.

Another species of poa, the *P. annua*—annual meadow-grass or Suffolk grass—is the commonest of all our grasses, and is found in every situation, from the lowest wet meadow to the highest dry hill-top, but in all places is considered a most vexatious weed, and is known to most persons as such in a high degree on gravel-walks, drives, and suchlike places. It blooms and matures seeds nearly the whole year round, and is particularly plentiful in Suffolk, from which county it derives one of its names.

The *Poaceæ* tribe contains seven other families besides its type *poa*, but none of them are of much value in an agricultural sense; the following may be shortly noticed:—*Catabrosa aquatica*—water hair-grass or whorl-grass (formerly placed by Smith and Hooker under the genus *Aira* in the tribe *Avenaceæ*)—is amongst the richest and sweetest of the British grasses, but has always been looked upon as unfit for cultivation on account of its *strict aquatic* habits. It is found to thrive on some of the irrigated meadows below Edinburgh, where it has an abundant supply of its favourite element. A variety of this species, *C. a. littoralis*—small or sea-water hair-grass—is common in some parts on the west coast, growing usually near to or within the influence of the tide. It sends out shoots in all directions, rooting at their joints and throwing up flowering stems; and it appears to be extremely palatable, being much sought after and eaten with avidity by cattle.

The *Briza* family, or quaking-grasses, belong also to this tribe. These possess no great agricultural value, although they have the rather peculiar property of thriving on poor and inferior soils. Their seeds soon lose their germinating powers, and are difficult to be had in any quantity.

The families of *Molenia* and *Melica*, or melic grasses, also range under the tribe *Poaceæ;* the former growing upon damp heathy moors, and the latter in woods or other shady places upon clayish spots of soil. Neither of them is of such importance as to demand further notice.

MEADOW FOXTAIL GRASS

(*Alopecurus pratensis*, of the tribe *Alopecuroideæ*).

Ear or panicle erect, from 1 to 2 inches in length, of an oblong form approaching to cylindrical, compact and hairy; calyx of two glumes of equal length, united at the base, and fringed on the keels and lateral ribs; awn long, arising from near the base of the palea and projecting more than half its length beyond; glumes adhering to the seed when ripe; stem and sheaths smooth, the upper sheath slightly inflated.

This is the *earliest* spring grass of all the superior species. Its root is fibrous and perennial, and it grows to a height of from 2 to 3 feet. It is the most relished of all the pasture grasses by every kind of cattle, and constitutes the principal herbage in very many

of our richest pastures and meadows. It is not very well adapted for alternate cropping mixtures, as it does not acquire its full productive powers till about the fourth year from time of sowing. It produces but a small quantity of rather scantily-furnished culms in comparison with the great mass of root-leaves; and these grow to a very large size, especially under irrigation, reproducing themselves also very rapidly, and withering little, as compared with those of the other large grasses. The meadow foxtail, consequently, having also an eminently perennial character, is admirably fitted to sow down meadow-land to be kept under regular irrigation; seeing, besides, that a meadowy soil or clayey loam, naturally of a medium degree of wetness, is the very sort of land upon which this grass grows in perfection. From its earliness and quickness of reproduction, it is found that the aftermath or second crop of hay of meadow foxtail is greater in bulk than the first or flowering crop. For *permanent pasture* also, on such soils as mentioned, the meadow foxtail may perhaps be considered *the best* grass we have.

The meadow foxtail contains most nutritive matter at the time of flowering. It flowers from the middle of May till the beginning of June, and ripens its seeds near the end of June. The seeds, from the downy glumes adhering to them, weigh very light—some 5½ to 6 lb. per bushel. They are subject, in some seasons, to a kind of disease, and consequently *good seeds* of this species rate high; such can scarcely ever be got under 1s. per lb. retail, generally higher.

The genus *Alopecurus* contains five other native species besides the *A. pratensis*, all of which, however, are comparatively worthless for agricultural purposes, and, with the exception of one, may be classed as weeds. The *A. geniculatus*—jointed or floating foxtail—is rather common throughout Britain. It grows naturally in *wet* places of *clayey* soil, and by the edges of pools; has a prostrate habit of growth, with kneed joints from which proceed roots; and the panicle or ear is much smaller, more tapering, and of a darker colour. It is scarcely ever touched by either horses, cows, or sheep. The *A. bulbosus* and *A. fulvus*—bulbous-rooted and orange-spiked foxtail grasses—are extremely rare in Scotland, much resemble the preceding in form and habits, and are both equally worthless, or rather more so. The *A. alpinus*—Alpine foxtail—is confined to some of our Highland mountains. It is known by its *short*, oval, silky-like ear, and seldom growing above 9 inches in height. This species is eaten by sheep, which appear to be rather fond of it. The *A. agrestis*—slender foxtail—is the worst in the family, and most inferior for agricultural uses. No description of cattle seem to touch it. It is known in some districts under the name of "black bent," and is upon some lands a very troublesome grass, being difficult of extirpation from its great powers of reproduction. It is more common in England than in Scotland, and prevails on poor exhausted soils, usually of a light nature. It is distinguished by

its long, slender, tapering purple ear, and in its stem and sheaths being roughish.

A foreign species, the *A. nigricans*—black-headed foxtail—was introduced into Britain some forty years or more ago; and later was brought into considerable notice by Mr Taunton, an experimental cultivator, after whom it is sometimes called *A. Tauntoniensis*. This species is remarkably early, producing also much late herbage, through having a slightly stoloniferous habit. It may be recommended on account of its constant large produce, and also as containing a large proportion of nutritive matter.

CRESTED DOGSTAIL GRASS
(*Cynosurus cristatus*, of the tribe *Festucaceæ*).

Panicle spike-like, from 1 to 1½ inches or more in length; spikelets of 3 to 5 florets, each spikelet having a deeply-cut or pectinated leaf attached to its base, termed an involucre, and the spikelets and involucres all directed to one side of the rachis, which is from that cause hidden on one side and visible on the other; root fibrous and perennial. This indigenous pasture-grass possesses a very ample range of adaptation for different kinds of soils, growing naturally both on dry sands and on wet clayish land, and also making luxuriant growths under irrigation. Its fibrous roots penetrate to a considerable depth, which enables the herbage to withstand a long continuance of hot dry weather. The culms grow to a height of 12 to 18 inches, and on wet meadows even 2 feet; they are thin, hard, and wiry, and are little if ever grazed by cattle, from which cause they may be seen on even heavily-stocked pastures, with their spikes full of ripened seeds, standing untouched during the autumn months; and, from the seeds thus falling into the soil year after year, the crested dogstail is found on many lands naturally by much far too predominant. The root-leaves, however, are relished and eaten by cattle, especially so by sheep, and, though small and fine, are produced in comparative profusion.

The crested dogstail, on account of the comparative small bulk of its produce, is by no means well suited for hay crops on the generality of soils; it is chiefly as a pasturage grass that it can be recommended, and particularly so for sheep-pasture on dry lightish soils of rather high altitude. It ought never to form more than a *small* ingredient in any pasture intended to be grazed by oxen, cows, or horses, alone. From the fine, short, close sward formed by the root-leaves, this grass is specially adapted to sow down bowling-greens and lawns as the main ingredient; and from the same property, a few of its seeds are desirable in sowing down irrigated meadows, as forming a close bottom to the hay. The dogstail is found not to thrive very well on chalky or calcareous soils. It is found to be inferior in nutritiousness to the ryegrass, and less also as regards bulk for hay, but from the abundance of its root-

leaves it is much superior for pasture. The seeds are small, with a very short point or awn, and ripen from the beginning till the second week in August; good seeds weigh heavy, about 25 lb. per bushel, and rate, on an average, from 10d. to 1s. per lb. If a culm of this grass is pulled in a green state, the spike-like panicle, during the process of drying, is found to curve or curl round, and to have then some resemblance to a sheep or collie dog's tail—hence its name.

There is one other species of dogstail indigenous to Britain—viz., the *C. echinatus*—rough dogstail grass—but it is very rare, and of no known agricultural value.

The *Sesleria cœrulea*—blue moor-grass—was formerly placed by some botanists in the genus *Cynosurus*, under the name of *C. cœruleus.* This grass is plentiful on some of our Highland hills, having a bare stem of 9 inches to a foot, topped with a short, oval, bluish-purple raceme, and producing *a little* herbage, which may occasionally take the edge off the teeth of a hungry sheep—otherwise, it is not of the least value to farmers.

FIBROUS-ROOTED, TALL, OAT-LIKE, SOFT-GRASS

(*Arrhenatherum avenaceum,* of the tribe *Avenaceæ*).

Known also as *Avena elatior* and *Holcus avenaceus.* Panicle large, loose, spreading, and leaning slightly to one side; spikelets of two florets on long footstalks; lowest floret barren or male only, with a very long awn arising from a little below the middle of the pale; upper floret perfect, with a short awn from immediately behind the summit; both florets hairy at the base; glumes two, and very unequal; root fibrous, slightly inclining to bulbous, and perennial.

This grass is cultivated in France to a greater extent than any other kind whatever, from which cause it is sometimes popularly known under the name of "French ryegrass." The culms have an average height of from 3 to 4 feet, with *long* flat leaves of a vivid-green colour. Although rather late in flowering—blooming towards the end of June and onwards—it produces an early and very plentiful supply of herbage in the spring months through its abundant root-leaves, and reproduces itself also very rapidly after being eaten or cut down, being one of the fastest growers of all our grasses. It has not been as yet much cultivated in this country, and consequently its agricultural merits are but little known; on the Continent, however, it is in some parts much cultivated, and is said to be eaten freely, or even greedily, by all kinds of cattle. Seeing that such is the case, it is very probable that, if farmers would make certain to sow only the seeds of the *true fibrous-rooted* species, the tall oat-grass would be found eminently qualified to sow either for hay crops or pasturage in any course of rotation usual in alternate husbandry.

The seeds presently rate at about 7d. to 8d. per lb. It is evident, however, that they might be had cheaper; and if a demand to any extent was springing up, they would doubtless soon become so.

The other species, *Arrhenatherum bulbosum*—bulbous-rooted oat-like soft-grass—is much more common than the preceding in most parts of this country, being found frequently growing on soils of a lightish nature by the hedge-sides of pasture and corn fields. Its root is formed of a series of small tubers or bulbs (sometimes as large as small marbles), but slightly attached to one another; and from the great tenacity of life which these tubers possess, this species is considered, and justly so, a most troublesome weed in cultivated arable land, and is with great difficulty got rid of: it is known to farmers in some places under the name of *knot-grass.* The herbage of this species is of coarser quality, and is not relished by cattle, not being eaten by them so long as any better herbage is to be had.

HARDISH FESCUE GRASS

(*Festuca durinscula*, of the tribe *Festucaceæ*).

Panicle erect, the upper part racemed, the lower branched, and spreading mostly to one side; stem under the panicle round and smooth; florets or seeds terminating in a point or short awn; leaves of the stem broader and more flattened than the root-leaves, which are long, narrow, and compressed, or wire-shaped, and evergreen; root perennial, fibrous, but very slightly creeping, and occasionally throwing out lateral shoots.

This is one of the best of our native grasses for *general usefulness.* Upon good land it grows to a height of from 18 inches to 2 feet. Like the dogstail grass, it has a very considerable range of adaptation, growing and thriving well upon widely different kinds of soils, and is well suited particularly for soils of a light dryish nature, as it resists better than most grasses the withering effects of excessive drought and heat in summer, and also maintains much of its vitality and greenness during winter. On account of these properties, and of its fine herbage, it is specially fitted as a main ingredient for laying down gentlemen's parks, lawns, and ornamental sheep and deer walks, these animals, besides, showing a high relish for this grass. It ought, however, never to be a *prominent* member in any mixture of seeds for pasture upon good arable land which is to be grazed principally by the *larger* cattle, as it is much inferior in productiveness and nutritiousness to most of the other pasture-grasses previously handled. This species matures its seeds about the middle of July, or sometimes rather later, and yields double the amount of nutriment when cut at the time of flowering than it does when the seeds are ripe. Good seeds average about 12 lb. weight per bushel, and sell presently at about 6d. per lb.

A number of grass plants peculiar to the *Festuca* family are

placed in the works of the older botanists as distinct species, such as *F. rubra*, *F. arenaria*, *F. glabra*, and *F. cambrica*, &c., but these are now all looked upon as *varieties* more or less wide of the hardish fescue. These varieties are distinguished chiefly by their creeping habit of root, and are found the most frequently upon light sands near the sea-coast: they are not suitable for cultivation except upon very light dry lands, where the fibrous-rooted grasses do not thrive. The best of them is the *F. dur. rubra*, purple or creeping hard fescue, which is a tall robust-growing variety, with the stem-foliage and also root-leaves broader and flatter than in the normal plant, and of a reddish-purple tint: its roots are powerfully creeping, throwing out lateral shoots; and it is very useful for sowing upon and consolidating drifting sands which have been brought under cultivation. The seeds of this variety usually rate a trifle higher than those of the common species.

SHEEP'S FESCUE GRASS

(*Festuca ovina*, of the tribe *Festucaceæ*).

Panicle short, contracted, and one-sided; spikelets of five or six florets, with very short awns; stem erect, quadrangular immediately under the panicle, and more or less roughish; root-leaves numerous and very narrow, rough and rigid, much curved, and of a rounded shape, and grow in small tufts; root perennial and fibrous.

This dwarfish grass grows naturally on rather dry soils, having a height in the culms of from 4 to 12 inches. It forms the greater part of the herbage upon many of the best sheep-pasture grounds in the Highlands, being in a special degree the favourite food of sheep; indeed, it is said that sheep have no relish for hill-pastures and heaths upon which this grass does not exist. The smallness of its produce renders it entirely unfit for hay crops; the *F. ovina* being much inferior in bulk, and also in nutritiousness, to the other agricultural fescues. Probably, however, from its very *fine* herbage adapting itself to the thorough reducing process of sheep's mastication, the *F. ovina* may yield up to them a greater amount of aliment than some of the more nutritious but larger and coarser grasses. The sheep's fescue has a very high altitude of growth, being found frequently at an elevation of 3000 to 4000 feet above the level of the sea, and is peculiarly adapted for sheep pasturage on all upland, heathy, or other soils, except when such is of a *wet* character. It might seem from the fineness of its herbage to be suitable for sowing down lawns, bowling-greens, &c., but it is disqualified for such purpose through its tufted habit of growth, and the difficulty experienced in shaving it close, so as to form a smooth regular surface. This species flowers about the middle of June and onwards, and ripens its seeds from the middle till end of July. The seeds rate at from 6d. to 8d. per lb.

There are many *varieties* of the sheep's fescue, and a few of these are treated by some botanists as *distinct* species. The following two are the principal ones, as being entitled to much notice from their agricultural or other merits:—

F. ovina, var. *hordeiformis*—barley-like fescue. The chief property of this variety is its earliness of growth, excelling in this respect the hardish fescues, and affording a very early bite to sheep. It comes into blossom about the end of May or early in June. The herbage is very fine, tender, and succulent; and the awns of the florets are long and barley-like—hence the name. The culms of this variety are longer and more uniform in thickness, and are suited for the manufacture of some of the finer kinds of straw-plait.

F. ovina, var. *augustifolia*, the *F. tenuifolia* of some botanists—fine-leaved fescue. This is a delicate variety, with much longer and more narrow slender leaves, and is also of a *less* tufted habit. It is not a frequent grass throughout Britain, but is common in some parts of our Highlands; and it abounds along with the normal sheep's fescue in many of the dry pastures of France. Although of comparatively little or no importance in the alternate cropping culture of land, it is well suited for forming a fine close short sward of grass in pleasure-grounds and suchlike.

The *F. ovina* and its *varieties* bear a resemblance more or less to the hardish fescues, but differ from them in being of smaller size and of a somewhat tufted habit, in the upper part of the stem being *rough* and *angular*, and in the root being always purely fibrous.

The reader will recollect what was previously mentioned of several large-growing species with *broad root-leaves*, formerly included in the genus *Festuca*, having been now placed under and constituted a new family—viz., *Bucetum;* so that now, besides the *F. duriuscula* and *F. ovina*, there are only other two *distinct* species native to Britain—viz., *F. bromoides* and *F. uniglumis*. The *Festuca bromoides*, barren fescue grass (placed by Lindley as *Vulpia bromoides*, and is the same plant also as the *F. myurus* and *F. pseudo-myurus* of Hooker, &c., which are only varieties of it), is a very common *annual fibrous-rooted* plant in Scotland and elsewhere, and the Ayrshire seedsmen and seed-raisers are much troubled in getting its seeds cleaned out from amongst the ryegrass. Its seeds are known in popular phraseology as "hairgrass," evidently derived from the *hairlike* appearance of the seeds with their *very long slender awns*, but the grass itself has no connection with the *Aira* family. When growing on thin dry soils and situations, the barren fescue is found from 2 to 6 inches in height, of a rigid make, and soon becomes parched; but on good cultivated land it grows to the height of 2 feet or more, of a graceful slender figure, with the panicle more luxuriant and gently drooping to one side. It is very worthless as a hay grass, and completely so, from its strict annual nature, for pasturage purposes; still, owing to its *annual* growth,

and also in that it has short *fibrous* roots which do not exhaust the soil, it does not by much deserve the excessive bad name which it gets as a weed; it is not nearly such an injurious plant the seeds of which to sow as are the crowfoots or "crawtae," the creeping wheat-grass or "couch," or even the Yorkshire fog, or some species of the *Bromi* ("goose grasses").

The remaining species, *F. uniglumis*, very much resembles the barren fescue, and is equally worthless as an agricultural grass. It is distinguished, as its name imports, by the almost total suppression of the *lower glume*. Though found in the south of England and Ireland, it is rarely, if ever, to be seen in Scotland.

These last two species are the only ones which can be classed as weeds in the large family of the fescues—both broad-leaved and fine-leaved—the Festuca genus ranking as the most valuable of all the grasses for hay and pasture purposes.

SLENDER OR RYEGRASS-LIKE FESCUE GRASS

(*Festuca loliacea*, of the tribe *Festucaceæ*).

Inflorescence spiked; spikelets of an acute oval form, on short footstalks, and of six to nine awnless florets; calyx always of two unequal smooth acute glumes; outer pale of floret five-ribbed; ligule very short and slightly decurrent.

This broad-root-leaved fescue is a native naturally of *moist* rich meadows. Its culms grow to about 2 feet in height, and its root is *strictly* perennial, fibrous, but sometimes slightly creeping. This species differs from the meadow fescue in having its inflorescence *spiked*, as in the ryegrass, and in a greater love for marshy or wet soils, but otherwise much resembles it in habit of growth and bulk of produce. Although the ryegrass-like fescue is more particularly adapted for sowing on good meadow-land, to be kept under irrigation as a hay grass, it also makes a good *permanent* pasture-grass for fertile, *rather moist* soils, superior to the ryegrass; but its cultivation is somewhat hindered through the difficulty of procuring sufficient supplies of seeds—the *true F. loliacea* producing but a small quantity of matured seeds, from which circumstance, and its general appearance and habits, it is considered a hybrid betwixt the meadow fescue and the floating sweet meadow-grass. There are several intermediate varieties, however, between it and the meadow fescue, with the spikelets on short branches at the base of the spike, which varieties are about equal in value, and more prolific in seed, and these are the sorts usually sold by seedsmen. Some of the varieties of this species are common on the best grazing pastures in parts of Belgium and of the Low Countries. The *F. loliacea* flowers during the month of July, and contains most nutritive matter at the time of flowering. It bears occasionally a considerable resem-

blance to the common ryegrass, but differs from it in its greater abundance of root-leaves, in the spikelets having *short foot-stalks*, and its calyx *always* consisting of *two glumes ;* it possesses, besides, a more perennial habit, improving in proportion to its age, which is exactly the reverse of the ryegrass. The *F. loliacea* is not generally quoted in seed-lists; the price of its seeds may be given as from 1s. to 1s. 3d. per lb.

TALL FERTILE FESCUE GRASS

(*Festuca elatior*, of the tribe *Festucaceæ*).

Panicle very large and compound; florets sometimes, but rarely, furnished with a very short rough awn from immediately behind the summit; summit of floret or seed membraneous, and the florets have a streak of red round the edges; stem smooth and striated and very leafy, growing in height from 3 to 4 feet or more; root perennial, fibrous.

This plant may be considered the original of the *broad-leaved* fescues. It is found growing frequently upon rich muddy clay ground along river-sides, sending its roots deep into the soil, and which have a *slightly creeping* habit. The panicle is a foot or more in length, widely spreading, and drooping to one side; in all other respects it is the same as the meadow fescue, but nearly double the size in all its parts. The writer has had several opportunities of seeing this grass (*F. elatior*) grown for hay, and upon the whole considers it to rank about first of the superior grasses in yielding a large bulk, equalling, if not excelling, even the cocksfoot, especially so when grown upon rather wet, deep, clayish soils, or even on a lighter medium soil *incumbent upon clay.* When grown for hay it ought to be mown early, just when coming into flower, as it not only contains more nutriment at that period of its growth, but also because it becomes rather coarse and reedy when allowed to stand till ripe. The tall fescue has been kept in the background and neglected on account of its somewhat coarse appearance, but it is freely eaten and relished by cattle either green or dry, and if mown as directed, would very amply repay in the hay crop, and also as pasture, upon all fertile medium clayish soils. To cultivate this grass under a similar system with the Italian ryegrass, it ought, and probably would, return an immense bulk: being rather a late grower, it would come in for cutting just about the time when the productive powers of the Italian were exhausted. The *F. elatior* flowers from the beginning till the middle of July, and ripens a profusion of seed in the early part of August. The seeds rate presently at about 9d. per lb. by retail; but if done on a larger scale, they could be preserved so as to sell at a much less figure, and yield at same time a handsome profit to the raiser.

The following three species fall now to be shortly noticed, and which will finish the important family of the fescue grasses:—

Festuca gigantea, formerly placed by Linnæus, Hooker, and others, as *Bromus giganteus*—tall bearded or giant fescue grass. This prolific species is now classed in the same family as the *broad-leaved* fescues. It is easily known from the tall fescue by its long beard or awn, which is much *longer* than the palea, and arises from *behind the summit*, and also by its *leaves* being *much broader* and of a very *dark green*. One distinctly-marked distinguishing character of it from that of the *Bromus* genus, is its *ligule* being *very short*, *decurrent*, of a reddish-brown colour, and embracing the stem more on one side than the other. It has, however, the peculiar mark of the brome grasses in a much greater degree than the other broad-leaved fescues—viz., in the summit of the outer pale being cleft into two points, whereas the *summits* are only *slightly membraneous* or ragged in the others. It is probably a cross betwixt the tall fescue and some one of the wood-growing species of the *Bromi*. The root of the giant fescue is fibrous and perennial, and its culms grow to a height of 3 to 4 feet, or sometimes more. Its natural *habitats* are in woods or other damp shady places, but it is found to grow well enough and thrive when cultivated in open fields; and though seemingly not much relished by cattle in a growing state, it is readily eaten by them when cut and made into hay. It would yield a very large bulk, and possibly might become more palatable if for some time under culture, and it is well worthy the attention of cultivators.

Festuca calamaria—wood-reed fescue, but which is now placed in the genus *Poa* as *P. sylvatica*—wood-reed meadow-grass. This species is of rather rare occurrence in this country. Unlike the preceding, it seems to be much relished by both cows and horses, as it is greedily eaten by them when found. It very probably possesses good properties enough entitling it to a share of cultivation, but its culture is much hindered through the difficulty of procuring its seeds in any quantity; however, its seeds are now offered in *foreign* lists, and, if they may be depended upon as genuine, can presently be had at about 9d. per pound.

The species *F. heterophylla*—various-leaved fescue grass—is a native of France, although now nearly fifty years since first introduced into Britain. This species is *extensively cultivated for hay* in some parts of the Continent, yielding a large bulk to the first cut, but its aftermath is said to be very inconsiderable. The root-leaves are long, narrow, and dark green, whilst its stem-leaves are broad and of a much lighter green: the root is fibrous and perennial; and its flowering culms, which are very numerous, grow to a height of from 3 to 5 feet. Price of its seeds, from 9d. per pound.

WOOD MEADOW-GRASS

(*Poa nemoralis*, of the tribe *Poaceæ*).

Panicle spreading, and slightly drooping to one side; florets webbed or downy—*i. e.*, hairy at their base; outer pale of floret five-ribbed; the uppermost sheath usually not so long—never longer than its leaf—and crowned with a very short obtuse ligule, or even merely the semblance of a ligule.

This species is not a frequent grass throughout Scotland, although common in certain localities, and, as its name implies, is found in its natural state only in shady places or woods of rich soil. The root is perennial, fibrous, but *slightly creeping*, particularly if growing in light soil; the culms are erect and slender, and grow from 18 inches to 2 feet high; and the whole plant is of a light green colour. The *P. nemoralis* ranks amongst the superior *permanent pasture* grasses, producing a considerable quantity of fine, succulent, and nutritive herbage, which cattle of all sorts are remarkably fond of. It is in a special manner well adapted for sowing down pleasure-grounds and other places where the *land is much shaded by trees*, thriving not only well in such situations, but forming a close sward where few of the other fine grasses can exist; nevertheless, it prospers also well enough when grown in open exposed situations, and even so although the soil may be rather light and inferior. It is rather a slow grower, particularly in the after-grass, but has a very regular, close habit of growth, choking and killing annual weeds in a marked manner better than most other grasses. This species blooms about the third week in June, and ripens its seeds towards the end of July. The average price of the seeds, about 1s. per pound, or rather less.

A frequent variety of the above—the *P. nem.*, var. *augustifolia*—has the panicle more erect, the leaves longer and narrower, the top-joint of the stem *near to* the panicle, and the *spikelets* of only *two florets*.

FLOATING GLYCERIA, OR FLOATING SWEET MEADOW-GRASS

(*Glyceria fluitans*, now usually called *Poa fluitans*, of the tribe *Poaceæ*).

Panicle very long and slender, sometimes only slightly branched at the base, but usually branched till near the very end; spikelets long and linear, of seven to ten florets, the florets variegated at the summit with a streak of silvery white; florets not webbed; outer pale of floret seven-ribbed.

This aquatic species grows wild on almost all alluvial marshes and wet meadows, and is very common in and by the sides of ditches of running water. Its root is perennial and creeping. The stems are much sheathed—the sheaths overlapping one another—and both stems and sheaths are of a flattish-oval shape; the leaves being

broad and very long, and of a dull green. The stem is decumbent near the root, oblique in the middle; the foliage floating on the surface of the water when that is present, and nearly erect in the upper part. The herbage of this grass is very *rich in saccharine* matter; and it is much sought after and eaten with avidity by cows. Being fond of an abundant supply of water, it is admirably adapted for all *regularly irrigated* meadows, and will yield also a considerable produce on pasture on common *wet* soils. Its seeds are much eaten by birds, and are very nutritious. In some parts of the Continent they are occasionally ground into flour in seasons of scarcity, and make bread little inferior to that made from wheat. This species flowers from the end of June and onwards, ripens its seeds irregularly, and they are easily shaken off when ripe from the beginning till middle of August; and the seeds rate at about 1s. per pound, sometimes less. The *varieties* of the spiked or slender fescue bear occasionally a resemblance to the *Poa fluitans.*

Another water species formerly included in the now extinct genus *Glyceria* is the *Poa aquatica*—reed or water sweet meadow-grass. This reedy species grows to great size, with large foliage and powerfully-creeping roots; but from its habits it is of little or no use for common farming hay purposes.

SWEET-SCENTED VERNAL OR SPRING GRASS

(*Anthoxanthum odoratum*, of the tribe *Anthoxanthaceæ*).

Inflorescence simple panicled; panicle close, appearing as if spiked, erect, about an inch and a half more or less in length, and of a long ovate form; spikelets about four or five together upon very short branches of one floret each; floret of two paleæ of equal size, of a brownish colour, and hairy, and both furnished with awns of unequal lengths; root fibrous, and very perennial.

The genus *Anthoxanthum* forms a tribe by itself.

This is the *earliest* of all the grasses, and is also one of the most enduring or *strictly permanent.* The culms on good pasture-land grow to about 9 inches or a foot in length; but on deep rich moist soils, where only this grass reaches perfection, they attain a height of 18 inches or more. It produces comparatively only a *small* bulk of herbage; the root-leaves being of medium length, flat, and acute, of a light green colour, and more or less hairy on both surfaces. Its culms are of little value, as they are seldom eaten, and even its root-leaves, although eaten in pasture along with other herbage, especially by sheep, seem to be by no means so much relished as those of the majority of pasture-grasses; still, as it is one of those few grasses which abound in *bitter extractive,* and also on account of its *very early* growth, it ought always to occupy the place of a *minor* ingredient in any mixture intended for *permanent* pasture. The after-grass of this species, unlike most of the superior pasture-

grasses, is found to contain more nourishment than the first cut or flowering crop. The *A. odoratum* is the only species native to Britain. It blooms from the middle of May, and ripens its seeds from middle till end of June. It is most abundant in nutritive matter when the seeds are ripe. The seeds, which generally have the brown hairy pales adhering to them, range in different seasons from 1s. 6d. to 2s. per pound.

One or two foreign species of this unogenerical plant have been introduced, but they are not of any agricultural value.

YELLOW OR GOLDEN OAT-GRASS

(*Trisetum flavescens*, of the tribe *Avenaceæ*).

Still more generally known and sold under the name *Avena flavescens.* Panicle erect, spreading, much branched—the lower branches arising from the rachis mostly in fives, and of a yellowish green, changing to a beautiful golden yellow when ripe; spikelets small and numerous, usually of three-awned florets, the outer pale of floret tinged with light green, bifid; awn longer than the pale, and becoming bent or angle-shaped when dry; leaves and sheaths hairy; ligule very short and obtuse.

This species is one of the most useful of the formerly large genus *Avena*, and is noted from all the other native species by the smallness of its seeds. The root is perennial, fibrous, but having a very slightly creeping habit; and the culms, which are smooth and polished, grow to a height of 1 to 2 feet. It yields a considerable produce of *fine herbage, if growing in mixture with other grasses.* It is naturally of high altitude, and is found to thrive best on dry and specially calcareous soils. It contains in its nutritive elements a large proportion of *bitter extract*, and can be recommended as a *minor* ingredient in the herbage of all pasture-land, especially if the land be of high elevation, and the herbage to be grazed chiefly by sheep. It comes into flower about the beginning of July, ripens its seeds from the beginning till middle of August, and contains rather more nutritive matter if taken when in flower than it does when the seeds are ripe. *Genuine unmixed* seeds of the golden oat-grass cannot usually be had under 2s. per lb. The seeds of *Aira flaxuosa*, noticed farther on, much resemble those of *Trisetum flavescens*, and the former may be, and possibly are, sometimes substituted and sold as the latter. Other two species of the genus *Trisetum*, the *T. pratense* (meadow oat-grass), and *T. pubescens* (downy oat-grass), have very little agricultural value. They are known from *T. flavescens* by their *spikelets* being *fewer* and much *larger*, and the *ligule* being *long* and *pointed.* They are found most frequently growing on rocky ground and dry heaths, occasionally also in meadows, but giving a preference always to calcareous soils.

The genus *Avena*, or oatlike grasses, formerly included a vast number of species, both native and foreign, most of which are now assigned by modern botanists to other genera. The only two native species now left in the family are the *A. strigosa*—British pointed oat (called also *Danthonia strigosa*), and the *A. fatua*—wild oat: both of these very much resemble each other, as well as the common cultivated oat (*A. sativa*), and are troublesome weeds to the farmer. The outer pale of the floret in *A. fatua* is *very hairy*, with *four* ribs on each side, and the *florets* are *much shorter* than the *glumes*; whilst in *A. strigosa* the florets are as long as the glumes, and the panicle inclines to one side.

The genus *Aira*, or hair-grasses, also ranges under the tribe *Avenaceæ*. Modern botanists have likewise much reduced this family in numbers, it comprising now only six native species, which are all more or less of little value in an agricultural sense, and some of them only worthless annual or injurious weeds. The *A. cæspitosa*—tufted hair-grass, star-grass, or hussock-grass—is the most common, and has a most unsightly appearance in pastures, growing in large tufts or "hussocks." It *prefers* soils of a *moist clayey* nature, and is frequent in some parts, growing in the ridge-furrows of undrained or wet pasture-fields. Its herbage is *very harsh*, and never eaten by cattle except when they are forced to it through want. It is only serviceable as a cover for game—*vermin* on only too many farms; and the sooner *A. cæspitosa* is rooted out of a farm the better. A variety of this species, *A. cæspitosa lutescens* (yellowish hair-grass), was introduced from the Low Countries by Mr Lawson of Edinburgh some years ago. It is much earlier and of *dwarfer* growth, has less tendency to form tufts, and its herbage is also more tender and agreeable to cattle. The seeds of this variety can now be had for about 9d. per lb.

The *A. flexuosa* (wavy mountain hair-grass) is plentiful on some of our Scotch hills, producing a little herbage, which is eaten by sheep; but it cannot be much recommended for cultivation, except, perhaps, in small proportion for *moorish soils*. Its seeds can be had from 6d. per lb.

[*To be continued.*]

EXPERIMENTS ON FEEDING TWO KINDS OF LEICESTERS.

By JOHN M'LAREN, Rossie Priory, Inchture.

[Premium—£10.]

AT the discussion in Edinburgh as to the advisability of having two classes of the Leicester sheep at shows of the Highland and Agricultural Society of Scotland, a question was raised as to which of the kinds of Leicesters, the White or Border, or the Blue or English, was the most profitable. In other words, was it ever ascertained by actual experiment whether, as stated, more sheep of small-boned and finer kind could be kept on the same amount of food than could be of the larger kind; and whether the small, although when sold not worth so much as the large, the proportion as to profit might be more evenly balanced, as per acre of land, than the selling prices of each seemed at first to warrant? Lord Kinnaird then proposed to undertake a set of experiments to try this. The following report is the result of this trial:—

After due consideration as to the best means of carrying out this experiment fully and fairly, and on a good foundation, his lordship put himself into communication with Mr Sandy of Home Pierrepoint as to the English Leicesters, and with Mr Usher, Stodrigg, as to the Border Leicesters. We were very much indebted to those gentlemen for the trouble they took in furnishing us with their advice and assistance in getting the best specimens of both kinds of Leicesters. Having determined to carry on the trial from the time they were lambs, Mr Sandy procured for us ten wether lambs from Colonel Inge near Tamworth, and Mr Usher also got for us ten wether lambs from Mr Hardie near Kelso. Although the experiment rests mainly between the above two lots, still Lord Kinnaird wished it somewhat more extensive, and ten wether lambs were selected from our own Leicester flock, and also ten wether lambs from our flock of grey-faced Cotswolds. This, though adding to the expense, also added to the experience, and gave nearly full work to the person in charge of all the weighings and measurements of food, &c. The experiment commenced on the 26th of August, by dividing a piece of rich old pasture into four equal pieces, further divisions being made by means of iron feeding-hurdles, moved four or five times a-day, according as required. We thus found out what quantity of grass alone each of the lots consumed in four weeks; all the sheep were weighed at the commencement of experiment, and every four weeks afterwards. The ground thus pastured by each lot was then allowed them for exercise during the winter months of the trial. I may here mention that the necessary confinement of the sheep occasioned us much trouble, owing to their

feet becoming sore, which was increased by a very wet season. This sometimes made a very great difference in the progress of all the lots; still, as they shared alike, it only made the value of all the sheep rather less at the end, so it could not interfere much with the results of the experiment.

The second four weeks they had cut clover weighed out to them in troughs, along with oats, cake, and Indian corn; of the artificial substances we regulated the supply to each lot as the animals would eat, thus leaving the more bulky portions of the food—as grass, clover, turnips, &c.—to test the qualities of the different kinds of sheep.

The third four weeks all the lots had turnips cut in troughs, along with hay, chaff, and oats, cake, and meal, as formerly; they had turnips and mangolds for eight months, when they returned to clover for part of the eleventh month, and on grass all the twelfth, in the same manner as the first month, with the addition of oilcake. During the trial they were carefully washed and shorn, and the wool of each sheep weighed, marked, and each lot kept separately. It was all sold at the same price, but the merchant said that the wool of the Border Leicesters, in the present markets, was of most value for his purpose, the grey-faced next, and the other Leicesters about equal. In the following tables we shall confine ourselves to each lot, as the particulars of each sheep for a year would only make a multiplicity of figures; and we think it quite sufficient for the purpose of the trial to show the weight at the commencement of experiment on 26th August, and the weight at the end, on the 25th of August following, along with the weight of wool and price; also the price of the sheep when sold, as against so much grass, turnips, mangolds, hay, corn, and cake consumed. Before doing so, however, we shall give the particulars of each lot.

No. 1 consisted of ten wether lambs from the flock of Colonel Inge, selected for this experiment by Mr Sandy. They were very early lambs, seemingly, and had been accustomed to artificial food before we got them. In fairness we had to allow them a fortnight's rest before commencing; they were, however, all sound. After being weighed they were put on their piece of grass on the 26th of August, their average weight at that time being 86½ lb. After the first month they did very well, but, owing to causes previously stated, the average gain on each weighing varied or ranged from 4 to nearly 13 lb. each sheep. The first month we had to put out one, on account of an unfortunate accident by which it got a broken leg; and, to make the lots equal, we also cast one from each of the others, thus reducing the number to nine, which number we carried through all the trial; but some, as previously stated, were from lameness and other causes not sound and well enough to afford a fair criterion of progress. We think, therefore, the best plan is to give the average weight of each sheep in the several lots at the commencement and end, thus making it immaterial whether ten or seven sheep were in the lot.

The average weight of ten sheep on 26th August was 86.5 lb.; the average weight of seven sheep on the 26th of August following was 156.2 lb.; gain in live weight, 69.7 lb.; weight of wool of nine sheep, 68 lb. 4 oz., which sold for £6, 5s. 1½d. The seven sheep were sold for £20. We may here mention that the sheep of this and the other lots were equally divided—one part sold in Edinburgh, and the other in Liverpool. Total for sheep and wool, £26, 5s. 1½d. The annexed tables will show the amount of food consumed by this lot during the trial.

No. 2 was composed of ten wether lambs, from the flock of Mr Robert Hardie, Hariotfield, near Kelso, selected for the purpose by Mr Usher, Stodrigg. They also were allowed about the same time as the previous lot before commencing the trial. This lot had also been accustomed to trough-feeding before, and were a nice lot of lambs; one of them died the first month of the trial, leaving nine to be carried on. They seemed to resist the influence of the confinement and bad weather better than their finer-bred opponents; but even their average gain per four weeks varied from nearly 5 to 15 lb. each. This was owing to the causes before stated. The average weight of the ten sheep on the 26th of August was 90 lb. On the 25th of August following, their average weight was 178.4 lb.; total gain (live weight), 88.4 lb. The weight of wool of nine sheep was 69 lb. 13 oz., which sold for £6, 8s. 0½d. The seven sheep of this lot sold for £22, 5s., making a total for sheep and wool of £28, 13s. 0½d. The tables also give the amount of food consumed by this lot during the trial.

No. 3 consisted of ten wether lambs bred by Lord Kinnaird from his Leicester flock; and here we may remark that we have almost always used the small-boned blue-faced Leicester, our rams being obtained from Messrs Burgess, Stone, Sandy, &c.; and our lambs were evidently at least six weeks younger than those of the preceding lots. They also laboured under the disadvantage of not having been accustomed to trough-feeding, for the most part having been newly taken off their mothers and confined for the trial; and, as a natural consequence, for the first two months they rather decreased than increased in weight. After that, however, they improved very rapidly, although, as in all the other lots, their improvement varied very much, as from 3 to 13 lb. each sheep. The average weight of the ten sheep on the 26th of August was 78.8 lb. per sheep, and at the end of experiment in August following, 149 lb.; the total gain, live weight, was thus 71.2 lb. each. The weight of wool of nine sheep was 62 lb. 2 oz., and sold for £5, 14s. Seven sheep of this lot sold for £19, 5s. Total for sheep and wool, £24, 19s. The food consumed will be found in the tables.

No 4 consisted of ten wether lambs, bred by Lord Kinnaird out of his flock of grey-faced Cotswolds; and we here take an opportunity of stating our high opinion of this class of sheep—wool,

mutton, and quality being largely combined. We are only sorry that we cannot give the *real* result of the trial of this lot, as in the month of February, during the trial, two of the best of the lot were found dead in one morning. They were replaced by others out of the flock, which however were not so heavy at the time, and they had the further disadvantage of not being accustomed to the confinement. The average gain in this lot was large, varying from 7 to 18 lb. each per four weeks. They did remarkably well after this. The average weight of ten sheep on the 26th of August was 95.1 lb., and the average weight of seven sheep on the 25th of August following was 180.5 lb.; total gain, live weight, was 85.4 lb. The weight of wool of nine sheep was 81 lb. 10 oz., which sold for £7, 9s. 8d. Seven sheep sold for £23, 12s. 6d. Total for sheep and wool, £31, 2s. 2d. The particulars of food consumed are furnished in the tables.

Prices of Food used during Experiment.

Kind of Food.	Colonel Inge.	Mr Hardie.	Lord Kinnaird's Leicesters.	Lord Kinnaird's Grey-faced.
Grass Pasture, .	£3 13 3	£3 17 4¾	£3 11 8½	£3 15 10½
Clover, Cut, .	5 2 0	5 6 4¾	4 5 6	5 15 1
Turnips, . .	6 3 9	6 19 3½	5 17 10½	7 6 1¾
Mangolds, . .	1 0 5½	1 1 2	1 0 3½	1 4 9¼
Hay, . .	1 10 2¾	1 15 3	1 9 3¾	1 17 8¾
Indian Corn, .	0 13 11	0 13 11	0 13 11	0 13 11
Oil-Cake, . .	7 5 10	8 2 8¾	6 1 1	7 18 7¼
Oats, . .	3 15 5¼	3 15 5¼	3 15 5¼	3 15 5¼
Total, .	£29 4 11	31 11 7½	26 15 2	32 7 7¼

Average Cost of Feeding each Sheep, Nine to each Lot.

Colonel Inge, ...	£3 5 0 nearly.
Mr Hardie, ...	3 10 2
Lord Kinnaird's Leicesters, . . .	2 19 5½
Lord Kinnaird's Cotswolds, . . .	3 11 11¼

Average Value of each Sheep.

Colonel Inge, ...	£3 15 0
Mr Hardie, ...	4 1 10¼
Lord Kinnaird's Leicesters, . . .	3 11 3¾
Lord Kinnaird's Cotswolds, . . .	4 8 10½

Food Consumed, Weight and Price of Wool, Weight and Price of Sheep, &c.

	Average Weight of Sheep at Commencement.	Grass Pasture.	Clover, Cut.	Turnips.	Mangolds.	Hay Chaff.	Indian Corn.	Oil-Cake.	Oats.	Weight of Sheep at Finish.	Weight of Wool.	Price of Wool.	Price of Sheep.	Price of Sheep and Wool.	Average Value of each Sheep.
	lb.	Square Yards.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb oz.	lb. oz.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1. Colonel Inge, .	86½	5909	2991	34,650	3822	887	195	1485	1098	156 2	68 4	6 5 1½	20 0 0	26 5 1½	3 15 0
2. Mr Hardie, . .	90	6244	3121	39,004	3953	1034	195	1657	1098	178 0	69 13	6 8 0½	22 5 0	28 13 0½	4 1 10¼
3. Lord Kinnaird's Leicesters, .	78.8	5785	2508	32,999	3790	866	195	1233	1098	149 0	62 2	5 14 0	19 5 0	24 19 0	3 11 3¼
4. Lord Kinnaird's Cotswolds, .	95.1	6121	3378	40,922	4625	1107	195	1615	1098	180 5	81 10	7 9 8	23 12 6	31 2 2	4 8 10½

Although the second table has little connection, if any, with the main point aimed at—the present trial not being conducted for profit merely, but more to test weights attained, and consumpt of food required to obtain these—still, putting a money-value on this food may help to bring out results more clearly. It is therefore assumed that the prices are alike for each lot, and as near the actual prices of the different articles at the time of the trial—say, pasture-grass at £3 per acre; clover at 3d. per stone, making the proportion of one-third hay at 9d. per stone; turnips at 8s. per ton; mangolds at 12s. per ton; Indian corn at £8 per ton; oilcake at £11 per ton; oats at 22s. per quarter, 40 lb. per bushel.

LIST OF PLOUGHING COMPETITIONS *reported to the Society in* 1863-64.

Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal awarded to
ABERDEENSHIRE—							
1. Ballater Association	Bridgend of Muick	22 Mar. 1864	19	½ acre	4½ hours	£3 15 0	George Riddle, Ballater
2. Buchan Society	Auchtydore	24 Dec. 1863	60	½ acre	4 hours 5 min.	5 8 6	Alexander Lorimer, Crooked Nook
3. Clatt, Leslie, and Premney As.	Mill of Johnston	24 Dec. 1863	42	1 rood 20 poles	4 hours	5 0 0	William Sharp, Sunnyside
4. Coldstone and Migvie Associa.	Blelack	1 Feb. 1864	57	½ acre	5 hours	7 14 6	John Farquharson, Galton
5. Countesswells Association ..	Loanhead	3 Dec. 1863	18	1 rood 24 poles	4 hours	3 18 0	James Fraser, Bishopdams
6. Crathie Club	Inner Farm	5 Ap. 1864	20	2 roods 16 poles	5 hours	4 2 6	William Brown, Bush
7. Forbes and Fordyce Associatn.	Tyronhill	24 Dec. 1863	32	¾ acre	4½ hours	3 0 0	James Murray, Redhouse
8. Leochel Cushnie Association ..	Wester Fouls	22 Mar. 1864	39	½ acre	5½ hours	5 15 6	Alexander Duncan, Tillyfour
9. Newhills Association	Buxburn	17 Dec. 1863	38	1 rood 22 poles	4 hours	3 18 0	Robert Arthur, Whitemyres
10. Strichen Society	Hillhead	30 Jan. 1864	37	½ acre	4 hours 20 m.	3 1 6	John King, Blackslack
ARGYLESHIRE—							
11. Islay, Colonsay, and Jura So.	Islay House Farm	18 Feb. 1864	23	1 acre	8 hours	3 0 0	Robert M'Lellan, Daill
12. Killean and Kilkalmonel Asso..	Largie	4 Mar. 1864	32	½ acre	5 hours	4 0 0	Archibald Carmichael, Avon
13. Killean and Kilkenzie Associa.	Bollivain	16 Feb. 1864	20	1 rood 35 poles	4 hours 40 m.	3 0 0	Mathew Stewart, Amad ..
14. Kintyre Association	Kilmichael	22 Jan. 1864	33	½ acre	5 hours	4 7 6	John Gemmell, Dalrioch
15. Lorn Society	Achnaba	10 Mar. 1864	17	1 rood 4 poles	4 hours 24 m.	3 0 0	Duncan Black, Barcaldine
16. Poltalloch Society	Barsloisnach	4 Feb. 1864	21	2 roods	5 hours	3 16 0	Dugald M'Alpine, Ballimore
17. Skipness and Saddle Society ..	Skipness	19 Feb. 1864	18	½ acre	5½ hours	6 2 6	A. M'Callum, Auchinasavil
AYRSHIRE—							
18. Ardrossan Society	Kerelaw	4 Feb. 1864	25	40 falls	4 hours	3 10 0	William Smith, Lochcraigs'
19. Ayr Parish Society	Alloway Croft	27 Jan. 1864	16	Rate of 1 acre Sco.	16 hours	5 18 6	Alexander White, Carcluie
20. Cumnock Association	Glengyran	28 Jan. 1864	22	1 rood	4 hours	4 10 0	Robert Stevenson, Garrallan
21. Fenwick Society	Thorn	6 Feb. 1864	24	Rate of 1 acre Sco.	16 hours	5 12 0	William Lindsay, Gardrum
22. Galston Association	Maxwood	26 Mar. 1864	17	½ acre	8 hours	3 0 0	Robert Taylor, Langside
23. Grougar Society	Caprickhill	4 Feb. 1864	15	Rate of 1 acre	15 hours	3 8 6	Matthew Young, Fleminghill
24. Kilbride, (West) Society ..	Woodside	3 Mar. 1864	29	Rate of 1 acre	12 hours	3 0 0	Thomas Dickie, Meadowhead
25. Kilmaurs Club	Greenhill	1 Feb. 1864	36	Rate of 1 acre	12 hours	6 10 0	Hugh Todd, Old Rome
26. Kirkmichael Association ..	Glastron	23 Jan. 1864	36	46 falls Scotch	4 hours 36 m.	3 2 6	Adam Bryce, Smithston
27. Kirkoswald Association ..	Kirklands	5 Mar. 1864	32	2 roods 16 falls Sco.	6½ hours	5 17 6	Thomas Gary, Batterson Mains
28. Mauchline Association	Lawersbridge	2 Feb. 1864	22	Rate of 1 acre	14 hours	4 18 0	William Wyllie, junior, Mossgiel
29. New Cumnock Association ..	Hall	16 Mar. 1864	15	Rate of 1 acre Sco.	16 hours	4 0 0	James Meikle, Auchincross
30. St Quivox Society	Fulshawood	27 Jan. 1864	20	66 falls	6 hours 36 m.	4 7 6	George Manson, High Thornyflat
31. Sorn Society	Nethershiel	27 Jan. 1864	19	1 rood	4 hours	3 10 0	John Morrison, Sorn Castle
32. Tarbolton Association	Coalshorn	23 Jan. 1864	24	Rate of 1 acre	14 hours	4 10 0	James Walker, Tongue
BANFFSHIRE—							
33. Inveravon, Aberlour, and Knockando Association ..	Mary Park	31 Dec. 1863	57	½ acre	5 hours	4 7 0	John M'Pherson, Blacksboat

LIST OF PLOUGHING COMPETITIONS (*continued*).

	Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent	Time.	Amount of Premiums.	First Premium and Silver Medal awarded to
	BERWICKSHIRE—							
34.	Chirnside Association	Ninewells Mains	3 Feb. 1864	21	Rate of 1 acre	10 hours	£3 15 0	John Waddel, Crofts
35.	Cockburnspath Association ..	Fulfordlees	17 Dec. 1863	25	¾ acre	7 hours	4 8 0	Thomas Galbraith, Neuk
36.	Coldstream Club	Simprin Mains	24 Dec. 1863	25	¾ acre	6½ hours	8 17 6	George Murray, Simprin Mains
37.	Dunse Association	Chalkie Law	30 Dec. 1863	28	¾ acre	7 hours	7 17 6	Thomas White, Dunse Law
38.	Eccles Association	Eccles Tofts	17 Dec. 1863	33	¾ acre	7 hours	5 0 0	George Hastie, Printonan
39.	Gordon Association	Rumbleton	30 Jan. 1864	25	¾ acre	6½ hours	6 7 6	George French, Rumbleton Law
40.	Kimmerghame Association ..	Middleshotts	27 Jan. 1864	24	2½ roods	6 hours 30 m.	5 15 0	John Wightman, Mollis Mains
41.	Lammermuir Club	Redpath	18 Dec. 1863	26	¾ acre	6 hours	3 0 0	James Lyall, Bothwell
42.	Legertwood Association ..	Corsbie	23 Dec. 1863	27	½ acre	5 hours	4 0 0	George Galbraith, Dods
43.	Westruther Society	Flass	26 Dec. 1863	28	¾ acre	6 hours 15 m.	4 8 6	David Thomson, Dods
	BUTE AND ARRAN—							
44.	Bute Society	Auchinterry	17 Feb. 1864	41	Rate of 1 acre Sco.	16 hours	7 19 0	James Harvey, Crossbeg
45.	Arran Society	Machrie	2 Mar. 1864	40	45 falls	5 hours	7 0 6	James Craig, Glenree
	CAITHNESS-SHIRE—							
46.	Caithness Society	Stirkoke	18 Feb. 1864	54	½ acre	5 hours	3 15 0	John Phimster, Hempriggs
47.	Latheron Society	Mains of Latheron	23 Mar. 1864	37	½ acre	5 hours	3 5 0	William Carnaby, Swiney
	CLACKMANNANSHIRE—							
48.	Logie and Lecrop Association..	Garvel	28 Feb. 1864	17	Rate of 1 acre Sco.	14 to 16 hours	4 2 6	Robert Hill, Broom
	DUMBARTONSHIRE—							
49.	Cardross Society	Ardoch	16 Feb. 1864	19	Rate of 1 acre Sco.	16 hours	6 10 0	James Colquhoun, Kilmahew
50.	Kirkintilloch Association ..	Walfiatt	28 Jan. 1864	19	Rate of 1 acre Sco.	16 hours	3 8 0	William Young, Shirva
51.	Kilmaronock and Bonhill As.	Mollanbowie	26 Jan. 1864	19	Rate of 1 acre Sco.	16 hours	5 9 0	William Buchanan, Blairquhomrie
	DUMFRIES-SHIRE—							
52.	Dalton Association	Whitecrofts	22 Jan. 1864	16	½ acre	5 hours	4 2 6	Jonah Grierson, Rotchel
53.	Kirtle Association	Fauldencleugh	29 Jan. 1864	33	½ acre	5 hours	6 5 0	George Farish, Branteth
54.	Penpont Society..	Cairnmill	22 Jan. 1864	20	½ acre	5 hours	5 18 0	Andrew Teflar, Arkland
55.	Springkell Association.. ..	Loganhouse	26 Jan. 1864	23	Rate of 1 acre	11 hours	5 0 0	Robert Tagert, Woodhouselees
56.	Upper Annandale Association	Craigbeck	26 Jan. 1864	35	½ acre	5 hours	6 7 6	James Gordon, Annanbank
57.	Westerkirk Society	Mid Knock	11 Mar. 1864	18	½ acre	5 hours	4 9 6	James Knox, Carlisgill
	EDINBURGHSHIRE—							
58.	Borthwick Society	Easter Middleton	11 Dec. 1863	35	1/10 acre	1 hour	7 12 6	Charles Lonie, Stobsmills
59.	Carrington and Whitehill Soc.	Edgelaw	21 Dec. 1863	30	½ acre	5 hours	4 16 6	Robert Nelson, Aikendean
60.	Cockpen and Newbattle Society	Dalhousie Castle	12 Dec. 1863	50	½ acre	5 hours	6 2 6	George Rutherford, Lingerwood
61.	Currie Association	Harlaw	29 Dec. 1863	34	½ acre	7½ hours	7 2 0	James Robertson, Harlaw
62.	Glencorse Association	Glencorse Mains	28 Jan. 1864	23	½ acre	5 hours	4 10 0	Peter Moffat, Glencorse
63.	Lasswade Society	Mount Marl	2 Feb. 1864	31	½ acre	6 hours	5 0 0	Thomas Kerr, Vewbank
64.	Newton Association	Craigour	29 Jan. 1864	22	½ acre	7 hours	3 11 6	Abram Ritchie, Cauldcoats
65.	West Calder Society	Mossend	26 Jan. 1864	26	Rate of 1 acre	10 hours	3 12 6	Robert Wallace, Burnhouse

LIST OF PLOUGHING COMPETITIONS (*continued*).

Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal Awarded to
ELGINSHIRE—							
66. Duthil Association	Mullochard	22 Mar. 1864	22	$\frac{1}{2}$ acre	5 hours	£3 0 6	Peter Grant, Auchterblair.
67. Spey, Avon, & Fiddochside As.	Ballindalloch	24 Dec. 1863	27	$\frac{1}{2}$ acre	$5\frac{1}{2}$ hours	3 9 0	John Macdonald, Marionburgh.
68. Urquhart Association	Blackleys	9 Mar. 1864	36	$\frac{1}{2}$ acre Scotch	5 hours	3 2 6	William Stewart, Mains of Innes.
FIFESHIRE—							
69. Auchtermuchty Society ..	Corston Mill	29 Jan. 1864	26	$\frac{1}{2}$ acre	5 hours	3 3 0	John Lyall, Caldwells.
70. Boarhills Association .. .	Balrymouth	19 Feb. 1864	31	$\frac{1}{2}$ acre	5 hours	4 7 6	Thomas Spence, Park Mill.
71. Crossgates Society	Southfod	18 Dec. 1863	38	$\frac{1}{2}$ acre	5 hours	3 17 6	David Adamson, Halbeath.
72. Dunnikier Association ..	Bogie	24 Dec. 1863	35	$\frac{1}{2}$ acre	5 hours	4 6 6	Thomas Brown, Cardenbarns.
73. Dysart Association	Wemyss Home Farm	22 Dec. 1863	39	$\frac{1}{2}$ acre	5 hours	4 7 0	John Webster, Wemyss.
74. Largo Society	Bonnyton	27 Jan. 1864	22	2 roods 1 poles	6 hours	3 7 6	William Latto, Largo House.
75. Leslie Society	Milldeans	27 Jan. 1864	32	3 roods	7 hours	3 16 0	Alexander Heatherwick, Strathendry.
FORFARSHIRE—							
76. Alyth and Airlie Society ..	Cantsmill	17 Dec. 1863	44	$\frac{1}{2}$ acre	5 hours	7 0 0	William Patterson, Grange of Airlie.
77. Cortachy Club	Caldham	17 Dec. 1863	29	$\frac{1}{2}$ acre	$5\frac{1}{2}$ hours	6 17 6	James Moncur, Inverquharity.
78. Inverarity Association ..	Ovenston	7 Dec. 1863	67	$\frac{1}{2}$ acre	5 hours	7 6 0	William Clark, Downiebank.
HADDINGTONSHIRE—							
79. Dunbar, Spott, & Innerwick Cb.	East Pinkerton	21 Jan. 1864	37	Rate of 1 acre	10 hours	4 7 6	John Lyall, Innerwick.
INVERNESS-SHIRE—							
80. Inverness Society	Dalmore of Inshes	15 Mar. 1864	45	Rate of 1 acre	10 hours	5 15 0	John Macdonald, Cranmore.
81. Petty and Ardersier Asso. ..	Mains of Connage	23 Mar. 1864	46	$\frac{1}{2}$ acre	5 hours	11 7 4	John M'Donald, Mains of Croy.
82. Strathspey Society	Ballintomb	29 Mar. 1864	29	$\frac{1}{2}$ acre	5 hours	3 1 6	Roderick M'Lennan, Heathfield.
KINCARDINESHIRE—							
83. Durris Association	Quetheelhead	24 Dec. 1863	49	$\frac{1}{2}$ acre	3 hrs. 20 m.	6 12 6	James Ross, Garrol.
84. Elsick Association	Elsick	13 Jan. 1864	20	$\frac{1}{2}$ acre	6 hours	6 12 6	Alexander Mutch, Newhall.
85. Fettercairn Club	Newton	5 Dec. 1863	31	$\frac{1}{3}$ acre	4 hours	4 0 0	George Beverley, Nether Powburn.
86. Howe of the Mearns Asso. ..	Townhead of Arbuthnott	22 Dec. 1863	70	$\frac{1}{2}$ acre	5 hours	3 14 0	David Robertson, Pittarrow.
87. Muchalls Association	Elrick	23 Dec. 1863	21	$\frac{1}{2}$ acre	5 hours	4 0 0	John Murray, Badens.
88. Netherley Association ..	Monquach	22 Dec. 1863	26	1 rood 10 poles	3 hrs. 20 m.	5 2 0	Joseph Duncan, Mains of Netherley.
89. Portlethen Association ..	Craighead of Badentoy	14 Jan. 1864	35	$\frac{1}{2}$ acre	5 hours	7 3 0	William Smith, Balquharn.
90. Rickarton and Ury Club ..	Easter Auquholly	23 Dec. 1863	21	Rate of 1 acre	10 hours	8 15 6	John Caird, Newbigging.
STEWARTRY OF KIRKCUD.—							
91. Glenkens Society	Craig, Balmaclellan	29 Jan. 1864	34	1 rood Scotch	$3\frac{1}{2}$ hours	4 7 6	David Tait, Craig.
92. New Abbey Society	Overton of Ingliston	29 Jan. 1864	25	$\frac{1}{2}$ acre	5 hours	5 7 6	John Mundell, Landis.
LANARKSHIRE—							
93. Cadder Society	Lumloch	26 Jan. 1864	34	2 roods	$7\frac{1}{2}$ hours	8 10 0	William M'Kean, Lumloch.
94. Kilbride (East) Society ..	Long Calderwood	26 Jan. 1864	29	Rate of 1 acre	10 hours	8 10 0	Thomas Cochran, Clochearn.
95. Old Monkland, &c., Society ..	Hillhead	29 Jan. 1864	28	Rate of 1 acre	14 hours	8 15 0	Thomas Hinshelwood, Spindlehow.
96. Wiston and Roberton Society	Greenhill	2 Feb. 1864	20	3 roods	7 hours	5 0 0	John Forest, Eastfield.

LIST OF PLOUGHING COMPETITIONS (*continued*).

Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal Awarded to
PEEBLESSHIRE—							
97. Manor Association	Woodhouse	29 Jan. 1864	15	2 roods 32 poles	7 hours	3 15 6	Robert Wilson, Glenrath.
98. Peebles Club	Bonnington	28 Jan. 1864	24	½ acre	5 hours	4 6 0	John Wilson, Chapelhill.
PERTHSHIRE—							
99. Abernethy Association ..	Cluny	27 Jan. 1864	28	½ acre	5 hours	3 16 0	Alexander Ness, Balgonie.
100. Ardoch Association	Quoigs	22 Mar. 1864	27	½ acre	5 hours	3 0 6	Peter Sharp, Blueton.
101. Arnprior Association ..	Mains of Arnprior	16 Feb. 1864	19	Rate of 1 acre	10 hours	3 15 0	James Taylor, Cardross.
102. Auchterarder Society ..	Drummondsfold	5 Feb. 1864	19	½ acre	5 hours	3 8 0	John Young, Kirkton.
103. Callander Association ..	Ballachallan	16 May 1864	19	1 rood 30 poles	6 hrs. 5 m.	3 10 0	Alexander M'Nab, Torrie.
104. Drummond Castle Assoc. ..	Balloch	18 Mar. 1864	20	1 rood 24 poles	6 hours	10 18 6	James Kay, Balloch.
105. Dunblane Association ..	Hungryhill	17 Mar. 1864	24	2 roods 8 poles	5½ hours	3 13 0	William Reid, junior, Kippenrate.
106. Fossoway and Tullibole Asso.	Wester Aldie	2 Feb. 1864	19	½ acre Scotch	6 hours	3 3 0	Mathew Fowls, Threapmuir.
107. Glenalmond Association ..	Tulshew	23 Mar. 1864	20	2 roods 2 poles	5½ hours	3 18 6	Daniel Miller, Fendoch.
108. Glenshee Association ..	Cambs	8 April 1864	15	¼ to ½ acre	6 hours	3 7 0	William Brown, Spittal of Glenshee.
109. Moulin Association	Pitarig	23 Mar. 1864	17	2 roods 13 poles		3 17 0	John Scott, Knockbarrie.
110. Port of Monteith Association	Easter Borland	18 Feb. 1864	19	Rate of 1 acre	10 hours	3 10 6	James Liddell, Lennieston.
111. St Martin Association ..	West Gairdrum	22 Mar. 1864	22	½ acre	5 hours	4 0 0	Peter Mann, Cairnbeddie.
112. Strathbraan Society	Balinloan	23 Mar. 1864	18	2 roods 10 poles	6 hours	3 0 6	John Robertson, Trochrie.
113. Weem Association	Farleyer	4 Mar. 1864	32	1 rood 21 poles	6 hours	6 15 0	Alexander Menzies, Lurgan.
RENFREWSHIRE—							
114. Erskine Society	Barangry	2 Feb. 1864	18	1 rood 25 poles	4½ hours	3 3 6	Andrew M'Neil, Barangry.
ROSS-SHIRE—							
115. Wester Ross Society	Fodderty	21 Mar. 1864	50	½ acre	6 hours	7 14 0	John Dingwall, Dochcarty.
ROXBURGHSHIRE—							
116. Lilliesleaf Society	Bewlie	18 Dec. 1863	39	½ acre	6½ hours	9 5 0	Robert Grieve, Middles.
117. Melrose Club	Crossflat	23 Jan. 1864	39	½ acre	7 hours	5 12 6	Benjamin Bell, New Belses.
118. Union Society	Redden	3 Feb. 1864	45	½ acre	6 hours	14 10 0	James Scott, junior, Softlaw, Hillhead.
119. West Teviotdale Society ..	Chapelhill	30 Dec. 1863	23	½ acre	5 hours	7 2 6	Andrew Pender, Harwood.
STIRLINGSHIRE—							
120. Baldernock Society	Branzeit	28 Jan. 1864	16	Rate of 1 acre Sc.	17 hours	4 6 0	Robert Findlay, Lower Blochearn.
121. Bannockburn & Plean Asso.	Pirnhall	27 Jan. 1864	27	½ acre	5 hours	5 5 0	David Paterson, Carnock.
122. Blairdrummond, &c., Club..	Hill of Drip	27 Jan. 1864	26	Rate of 1 acre Sc.	14 hours	4 18 0	Daniel Ferguson, Robertson's Lane.
123. E. District of Stirlingshire As.	Carmines	29 Jan. 1864	28	Rate of 1 acre	14 hours	5 13 6	John Gilchrist, Highlandykes.
124. Killearn, &c., Society ..	Babtiston	26 Jan. 1864	18	1 rood 24 poles	5 hrs. 36 m.	3 8 0	John Brown, Kilfeaset.
WIGTOWNSHIRE—							
125. Inch Association	Mount Pleasant	23 Jan. 1864	34	½ acre	6 hours	4 10 0	Hugh Devin, Kirkminnoch.
126. Kirkmaiden Association ..	Clanyard	16 Jan. 1864	42	½ acre Scotch.	5½ hours	4 7 6	Robert Caufield, Clanyard.
127. Machars Association	Waulkmill	28 Jan. 1864	49	½ acre	5 hours	4 10 0	James M'Donald, Craigdoo.
128. Old Luce Association ..	Droughdool	31 Jan. 1864	31	½ acre	5 hours	5 1 0	John Kerr, Genoch.
129. Stoneykirk Association ..	Kirkclauchan	14 Jan. 1864	30	½ acre	5 hours	4 15 0	Robert Blair, Caldons.

PROCEEDINGS IN THE LABORATORY.

By Thomas Anderson, M.D., Professor of Chemistry in the University of Glasgow, and Chemist to the Society.

ON THE COMPOSITION OF THE POTATO PLANT, AND THE EFFECT OF DIFFERENT MANURES ON THE AMOUNT AND QUALITY OF ITS PRODUCE.

Part II.

The first part of this paper, which appeared in the number of the Transactions for July 1863, was devoted to the discussion of the composition of the potatoes used for the experiments, the manures applied to them, and the amount of the produce obtained. The pages which follow treat of the composition of the different parts of the crop, and embrace the results of a large number of very elaborate and laborious analyses. Without going into details, it may be sufficient to remind the reader, that the object of the experiments was twofold: 1st, To determine the relative amounts of produce yielded by different varieties of potatoes when cultivated on different soils; and 2d, To ascertain the effect of different manures on the produce. For the former purpose, six varieties of potatoes were selected, namely, Regents, Dalmahoys, White-rocks, Flukes, Skerry-blues, and Orkney-reds, these being believed to be the kinds most extensively used in Scotland, and they were grown on three kinds of soil, a heavy clay, a light sandy soil, and newly reclaimed moss, each being manured according to the ordinary system in use in the district, and which experience had shown to be most suitable to the soil in question. To determine the effect of different manures on all these varieties would have required so large a number of experiments as to be practically unworkable, either in the field or the laboratory, and in following out this part of the subject, the experiments were restricted to two varieties, namely, Regents and Dalmahoys. Even with this restriction, the amount of work proved much larger than was anticipated, and it was found impossible to carry out the analyses through all the details with the same degree of minuteness as had been done in the case of the seed-potatoes. With the latter, the analyses could be performed at leisure, but when the crop was examined, it was indispensable that the experiments should be made at once before the plants had lost water by evaporation, or had undergone any other change; and those who are familiar with such analyses will best understand how impossible it is to undertake more than a certain number within a given time, and how greatly the risk of error is increased by attempting to hurry through more than can be easily accomplished. For this reason, it was found that one part of the original plan could not be carried out with the degree of completeness at first proposed. It

had been intended to trace the progress of the potato through five or six stages of its growth, as had been done with the turnip and wheat plants in previous years, but it was soon apparent that this could not be done with any prospect of success where so many analyses had to be made, and it became necessary to restrict the inquiry in this direction within much narrower limits than had been at first intended. The experiments in this department were therefore confined to the examination of the potatoes from Woolmet and Dargavel when ripe, and at one or two intermediate stages of growth, and those from Troon only when ripe. Even with this limitation, the inquiry proved most laborious.

In prosecuting the subject it was also found necessary to modify to some extent the method of analysis of the tubers. It was in fact impossible to make these as complete as in the case of the seed-potatoes. This applies more particularly to the determination of starch, which is a tedious operation, requiring much care and time, and the consequence is that when a number of tubers are taken up at the same time, it is impossible to make the determination on all with any degree of satisfaction. In fact, where a large number of vegetable products are to be examined, the great object of the analyst must be to dry them as rapidly as possible, and then all the further operations must be such as can be performed on the substance in the dry state. It is impossible to determine starch with accuracy when the substance containing it has been dried by artificial heat, and the same observation applies to the soluble albuminous compounds. Some of these are coagulated by heat, in the same manner as the white of egg is, so that those which remain soluble after heating afford no criterion of the quantity which existed in that state before the substance was dried. For this reason it became necessary to confine the determination as made on the fresh plants to the ash, organic matter, and total albuminous compounds. In following out the experiments, six plants selected as giving a fair average of the whole of each plot were carefully lifted so as to avoid injuring the roots or losing any of the tubers, and the whole despatched entire to the laboratory. Immediately on being received they were weighed entire, and the tubers, roots, and stems or haulms being separately weighed, the correspondence of the sum of these with the total weight afforded a check on the accuracy of the weighing. A portion of each part of the plant was weighed and dried, the tubers being cut into thin slices to facilitate this process, and the amount of water was thus ascertained. The remainder of the plants was also dried, and the perfectly dry matter preserved in stoppered bottles for further experiments. The rest of the analyses does not call for detailed explanation.

COMPOSITION OF DALMAHOYS GROWN AT WOOLMET.

1st,—*Dalmahoys planted 18th and 19th April, and taken up on 13th July, that is, when less than half grown.*

I. TABLE giving the Weight of Tubers, Haulms, and Roots in Six Dalmahoys, and Average for each Plant.

Manure employed.		No. of Tubers on 6 Plants.	No. of Tubers on each Plant.	Diameter of Tubers.	Weight of 6 Plants in Grains.	Average Weight of Plants in Grains.
None.	Tubers	60	10	2" to ¼"	43,750	7,291
	Haulms	...	...	...	31,000	5,166
	Roots	...	...	...	1,440	240
	Total	...	...	...	76,190	12,697
5 cwt. superphosphate, and 3 cwt. guano.	Tubers	50	8.3	2½" to ¼"	41,670	6,945
	Haulms	...	...	...	51,001	8,500
	Roots	...	...	...	2,729	355
	Total	...	...	...	94,400	15,800
25 tons farmyard manure.	Tubers	76	12.6	2½" to ¼"	44,200	7,366
	Haulms	...	...	...	37,740	6,290
	Roots	...	...	...	2,400	400
	Total	...	...	...	84,340	14,056
35 tons farmyard manure.	Tubers	100	16.6	2" to ⅛"	39,640	6,606
	Haulms	...	...	...	39,750	6,625
	Roots	...	...	...	1,135	189
	Total	...	...	...	80,525	13,420

II. TABLE giving the Amount of Water, Ash, Albuminous Compounds, and other Organic Matters in Dalmahoy Potatoes.

Manure.		Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen. In wet Substance.	Nitrogen. In Dry Substance.	Ash in Dry Substance.
8. None.	Tubers,	79.84	1.93	17.14	1.01	.31	1.55	5.04
	Haulms,	89.60	3.81	4.84	.92	.61	5.96	8.88
	Roots,	73.35	2.87	18.84	3.44	.46	1.86	12.94
9. 5 cwt. superphosphate and 3 cwt. guano.	Tubers,	79.15	1.81	18.22	.77	.29	1.39	3.71
	Haulms,	89.65	3.37	7.55	1.21	.54	5.20	11.70
	Roots,	73.35	3.68	15.23	3.73	.59	2.23	14.04
10. 25 tons dung	Tubers,	79.19	1.68	18.13	.86	.27	1.33	4.18
	Haulms,	89.69	2.37	5.96	2.19	.38	3.71	19.92
	Roots,	70.06	4.25	18.22	3.16	.58	2.33	10.55
11. 35 tons dung	Tubers,	81.13	1.75	16.10	1.00	.28	1.43	5.32
	Haulms,	88.71	2.50	6.55	2.98	.40	3.62	26.47
	Roots,	85.25	1.50	11.88	1.37	.24	1.66	9.32

III. TABLE giving the Weight of Tubers, Haulms, and Roots in Six Regent Potatoes, and Average for each Plant.

Manure.		No. of Tubers on Six Plants.	Average No. of Tubers on each Plant.	Diameter of Tubers.	Weight of Six Plants in Grains.	Average Weight of Plants in Grains.
None.	Tubers,	50	8.3	2″ to ¼″	27,150	4,525
	Haulms,	...	...	...	20,740	3,457
	Roots,	...	...	...	1,135	189
	Total,	...	...	...	49,025	8,171
5 cwt. superphosphate and 3 cwt. guano.	Tubers,	52	8.6	3″ to ¼″	38,650	6,441
	Haulms,	...	...	...	20,140	3,356
	Roots,	...	...	...	801	133
	Total,	...	...	...	59,591	9,930
25 tons farmyard manure.	Tubers,	52	8.6	2½″ to ¼″	36,770	6,128
	Haulms,	...	...	...	25,200	4,200
	Roots,	...	...	...	1,400	233
	Total,	...	...	...	63,370	10,561
35 tons farmyard manure.	Tubers,	62	10.3	2¼″ to ¼″	32,100	5,350
	Haulms,	...	...	...	20,500	3,416
	Roots,	...	...	...	1,040	173
	Total,	...	...	...	53,640	8,939

IV. TABLE giving the Amount of Water, Albuminous Compounds, and other Organic Matters in Regent Potatoes.

Manure.		Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen. In Wet Substance.	Nitrogen. In Dry Substance.	Ash in Dry Substance.
12. None.	Tubers,	76.86	2.31	20.00	.75	.37	1.63	3.59
	Haulms,	87.78	3.19	6.65	2.28	.51	4.21	19.57
	Roots,	82.11	1.43	15.53	.72	.23	1.90	5.19
13. 5 cwt. superphosphate and 3 cwt. guano.	Tubers,	79.74	2.37	17.25	.64	.38	1.89	3.15
	Haulms,	80.49	5.12	10.20	4.19	.83	4.26	21.47
	Roots,	70.06	4.12	24.09	1.73	.66	2.22	5.79
14. 25 tons dung	Tubers,	77.96	1.87	19.25	.92	.30	1.39	4.17
	Haulms,	88.75	2.43	5.89	2.93	.39	3.47	26.04
	Roots,	85.52	1.93	11.20	1.34	.31	2.19	9.26
15. 35 tons dung	Tubers,	80.18	2.50	16.36	.96	.40	2.03	4.84
	Haulms,	88.44	3.06	5.01	3.49	.49	4.27	30.99
	Roots,	82.07	2.62	14.51	.80	.42	2.39	4.47

The most interesting point brought out by these analyses is perhaps the increased number of tubers developed by the action of farmyard manure. The effect is most remarkably seen in the case

of Dalmahoys, in which the tubers produced by the large manuring are just 66 per cent more numerous than where no manure is applied. In the Regents the effect is less marked, but it is in the same direction. This observation, it must be observed, applies to the *number* of tubers only, and not to their weight, for where they were most numerous their average weight was generally smallest. Thus, for example, while the number of tubers yielded by six plants of Dalmahoys had risen under the influence of 35 tons of dung from 60 to 100, the total weight of the 60 tubers was 43,750 grains, while that of the 100 was only 39,640, or actually less than that of the unmanured plot. In Dalmahoys there is, however, an increase in the absolute weight, though it is not great. It would appear, then, that the effect of the manures at this stage of the growth of the potato is expended in promoting the vigour of the crop, and in producing an increased number of tubers. As far as the composition of the tubers are concerned, the chief difference lies in the proportion of water which they contain, especially in the Regents, the effect of the manure being to increase the percentage of this substance. To these points, however, more detailed reference will afterwards be made.

2d,—*Dalmahoys grown at Woolmet and lifted when ripe, 21st October* 1862.

V. TABLE giving the weight of Tubers, Haulms, and Roots in Six Dalmahoys, and Average for each Plant.

Manure.		No. of Tubers on six plants.	Average No. of Tubers on each plant.	Diameter of tubers.	Weight of six plants.	Average of each plant.
					Good. Diseased.	Good. Diseased.
None.	Tubers,	52	8.6	4" to ½"	40,100 18,800	6683 3133
	Haulms,	...	...	...	10,900	1816
	Roots,	...	...	...	1,176	196
	Total,	...	...	...	70,976	11,828
5 cwt. superphosphate and 3 cwt. guano, .	Tubers,	54	9	4" to 1"	74,300 17,400	12,383 2900
	Haulms,	...	...	...	9,840	1640
	Roots,	...	...	...	960	160
	Total,	...	...	...	102,500	17,083
25 tons farmyard manure, .	Tubers,	54	9	4" to ½"	73,200 30,100	12,200 5016
	Haulms,	...	...	...	10,500	1750
	Roots,	...	...	...	1,670	278
	Total,	...	...	...	115,470	19,244
35 tons farmyard manure, . .	Tubers,	54	9	4" to ½"	63,300 38,500	10,550 6416
	Haulms,	...	...	...	9,400	1566
	Roots,	...	...	...	1,152	192
	Total,	...	...	...	112,352	18,724

VI. TABLE giving the amount of Water, Albuminous Compounds, other Organic Matters, and Ash in the ripe Dalmahoys.

Manure.		Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen. In Wet Substance.	Nitrogen. In Dry Substance.
None.	Tubers,	74.44	.81	23.69	1.06	.13	.53
	Haulms,	75.87	1.62	19.61	2.90	.26	1.07
	Roots,	62.28	2.50	32.07	3.15	.40	1.12
5 cwt. super-phosphate, and 3 cwt. of guano.	Tubers,	71.67	1.00	26.45	.88	.16	.69
	Haulms,	77.28	1.37	17.21	4.14	.22	.96
	Roots,	64.23	2.18	27.44	5.15	.34	.96
25 tons dung.	Tubers,	76.42	.81	21.66	1.01	.13	.59
	Haulms,	76.24	1.25	18.83	3.58	.20	.85
	Roots,	63.51	1.18	29.69	4.62	.19	.53
35 tons dung.	Tubers,	78.20	.50	20.19	1.11	.08	.37
	Haulms,	76.00	1.68	18.78	3.46	.27	1.13
	Roots,	60.67	2.75	32.03	4.55	.44	1.12

VII. TABLE giving the Composition of the Ash in the Haulms of Dalmahoy potatoes.

	No Manure.	5 cwt. Super-Phosphate and 3 cwt. Guano.	25 tons dung.	35 tons dung.
Peroxide of Iron, .	1.46	1.26	1.27	1.31
Lime, ...	20.72	21.57	19.51	21,38
Magnesia, . . .	5.03	5.04	5.12	4.80
Potash, . . .	14.38	14.95	16.48	18.92
Soda, ...	...	...	...	...
Chloride of potassium,	24.70	25.44	24.53	23.21
Chloride of sodium, .	0.07	0.32	...	0.20
Phosphoric acid, . .	14.31	11.91	12,62	11.23
Sulphuric acid, . .	5.52	5.29	3.84	5.54
Carbonic acid, . .	13.81	14.22	16.63	13.41
	100.00	100.00	100.00	100.00

VIII. TABLE giving the Composition of the Ash of the Tubers of Dalmahoy Potatoes.

	No Manure.	5 cwt. Super-Phosphate and 3 cwt. Guano.	25 tons dung.	35 tons dung.
Peroxide of iron, .	2.13	1.99	2.52	2.31
Lime, . . .	2,52	2.24	2.02	3.52
Magnesia, . .	2.66	2.51	4.02	2.44
Potash, . . .	42.53	52.22	42.51	57.61
Soda, . . .	9.60	5.30	...	2.12
Chloride of potassium,	...	...	7.85	...
Chloride of sodium, .	6.14	5.86	4.63	3.66
Phosphoric acid, .	9.03	9.92	12.71	7.43
Sulphuric acid, .	2.64	3.08	6.93	5.21
Silicic acid, . .	0.36	0.42	0.33	...
Carbonic acid, . .	8.91	8.60	13.35	9.59
Charcoal, . .	11.76	6.02	2.52	4.60
Sand, . . .	1.32	1.04	1.01	1.51
	99.46	99.20	99.12	100.00

The same, after deduction of sand, charcoal, and carbonic acid:—

	No Manure.	5 cwt. Super-Phosphate and 3 cwt. Guano.	25 tons dung.	35 tons dung.
Peroxide of iron,	2.69	2.40	2.15	2.70
Lime,	3.18	2.64	2.45	4.16
Magnesia,	3.37	3.01	4.91	2.88
Potash,	54.02	63.04	51.89	68.31
Soda,	12.24	6.36	...	2.51
Chloride of potassium,	...	...	9.76	...
Chloride of sodium,	8.85	7.01	5.62	84.34
Phosphoric acid,	12.30	11.91	8.43	8.88
Sulphuric acid,	3.35	3.63	14.89	6.22
	100.00	100.00	100.00	100.00

IX. Table giving the Weight of Tubers, Haulms, and Roots in Six Regents, and Average for each Plant.

Manure.		No. of Tubers on six plants.	Average No. of Tubers on each plant.	Diameter of Tubers.	Weight of six plants. Good.	Weight of six plants. Diseased.	Average weight of each plant. Good.	Average weight of each plant. Diseased.
None.	Tubers,	43	7.1	2½" to ½"	36,100	16,200	6,014	2,700
	Haulms,	...	...	...	10,100		1,683	
	Roots,	...	...	...	1,750		291	
5 cwt. superphosphate and 3 cwt. guano,	Tubers,	65	10.8	4" to 1"	48,800	47,500	8,133	7,916
	Haulms,	...	...	...	10,100		1,683	
	Roots,	...	...	...	1,450		241	
25 tons farmyard manure,	Tubers,	63	10.5	3½" to ½"	48,100	26,600	8,014	4,433
	Haulms,	...	...	...	8,300		1,383	
	Roots,	...	...	...	1,240		206	
35 tons farmyard manure,	Tubers,	54	9.0	3½" to ½"	45,700	23,650	7,616	3,941
	Haulms,	...	...	...	9,950		1,658	
	Roots,	...	...	...	1,084		180	

X. Table giving the amount of Water, Albuminous Compounds, other Organic Matters, and Ash in Six Regents, and Average for each Plant.

Manure.		Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen. In Wet Substance.	Nitrogen. In Dry Substance.
None.	Tubers,	75.33	0.87	22.74	1.06	.14	.57
	Haulms,	86.67	1.50	15.73	3.10	.24	1.27
	Roots,	59.32	2.62	33.48	4.58	.42	1.05
5 cwt. superphosphate and 3 cwt. guano,	Tubers,	76.90	1.00	21.08	1.02	.16	.71
	Haulms,	76.68	1.08	18.76	2.88	.27	1.17
	Roots,	66.00	1.93	27.01	5.04	.31	.91
25 tons farmyard manure,	Tubers,	76.45	1.31	21.21	1.03	.21	.91
	Haulms,	78.50	2.18	16.59	2.73	.35	1.66
	Roots,	65.56	2.00	28.46	3.98	.32	.96
35 tons farmyard manure,	Tubers,	75.77	1.00	22.14	1.09	.16	.67
	Haulms,	76.00	1.75	18.72	3.43	.28	1.17
	Roots,	67.40	2.37	26.34	3.83	.38	1.17

XI. Table giving the Composition of the Ash of the Haulms of Regent Potatoes.

	No Manure.	5 cwt. superphosphate, 3 cwt. guano.	25 tons dung.	35 tons dung.
Peroxide of iron,	1.20	1.54	1.30	1.34
Lime,	20.92	21.30	20.99	21.40
Magnesia,	4.47	4.79	4.67	4.66
Potash,	18.36	17.29	17.46	17.58
Chloride of potassium,	22.76	24.41	24.25	25.03
Chloride of sodium,	0.50	0.04	0.31	...
Phosphoric acid,	11.35	11.75	11.32	10.91
Sulphuric acid,	5.26	4.37	3.89	4.38
Carbonic acid,	15.18	14.51	15.80	1.34
	100.00	100.00	100.00	100.00

XII. Table giving the Composition of the Ash of the Tubers of Regent Potatoes.

	No Manure.	25 tons dung.	35 tons dung.
Peroxide of iron,	0.79	4.24	5.83
Lime,	2.05	1.12	1.13
Magnesia,	4.57	1.41	1.14
Potash,	41.07	48.76	47.70
Soda,	...	10.37	5.30
Chloride of potassium,	9.98	...	...
Chloride of sodium,	6.61	8.23	6.81
Phosphoric acid,	11.09	8.78	6.72
Sulphuric acid,	5.51	5.93	5.38
Silicic acid,	0.28	...	...
Carbonic acid,	15.19	2.34	10.19
Charcoal,	1.39	5.36	6.61
Sand,	0.81	3.46	2.01
	99.44	100.00	99.23

The same, after deduction of sand, charcoal, and carbonic acid:—

	No Manure.	25 tons dung.	35 tons dung.
Peroxide of iron,	0.96	4.77	7.18
Lime,	2.49	1.26	1.31
Magnesia,	5.69	1.59	1.32
Potash,	50.26	54.95	60.07
Soda,	...	11.62	6.62
Chloride of potassium,	12.31	...	...
Chloride of sodium,	8.06	9.26	8.49
Phosphoric acid,	13.57	9.88	8.39
Sulphuric acid,	6.72	6.67	6.62
	100.00	100.00	100.00

From the minute examination of the foregoing tables, many interesting and important conclusions may be drawn. In the first place, it is to be noted that the proportion of healthy and diseased tubers found on the six plants examined in the laboratory, is not

always in accordance with that ascertained by Mr Gibson by actual weighings of the entire produce, as given in the table contained in the first part of this paper (Transactions, No. 81, p. 53). It was scarcely to be expected, however, that there should be a very close correspondence owing to the difficulty of drawing the line between the healthy and diseased tuber. In my own observations, every tuber was carefully washed, and the entire surface examined in the first place, and then the tubers were cut across and examined in all the suspicious points, so that it might have been anticipated that the laboratory estimate should in all cases have been higher than in the rougher selection in the field, where the unwashed tubers are examined, and trifling symptoms of disease may be readily overlooked. The general correspondence between the two results, however, may be described as satisfactory, there being but one instance in which the discrepancy is very marked—namely, in the Dalmahoys grown with superphosphate and guano—where the laboratory result gives a much larger proportion of diseased potatoes than that got in the field. In this particular case, however, the number of slightly diseased tubers was large; and it is to this, no doubt, that the discrepancy is due.

The most remarkable fact brought out by a comparison of the weights of the immature and ripe plants, is the immense effect of the manures in promoting the growth of the plants during the latter part of their existence. It is to be observed, for instance, that the tubers from six plants of the unmanured Dalmahoys, in the middle of their growth, weigh, in round numbers, 43,700 grains; and when ripe they have only increased to 58,900, or by little more than a third; while those manured with superphosphate and guano have increased from 41,600 grains to 91,700, or considerably more than twice their former weight. With the Regents the effect is similar, though less marked. It would appear, therefore, that, in the early stages of its growth, the potato is to a great extent independent of the manures it receives, and is only conspicuously acted upon by them when it approaches maturity. The haulms, on the other hand, in place of increasing, have greatly diminished in weight, but the reason for this is very obvious: the potatoes were raised when ripe, but previous to that the leaves and stems had begun to decay; and accordingly, in place of a fully developed healthy plant, I received only the blackened stems which had already lost most of their leaves. To have obtained a proper estimate of the amount of matters contained in the leaves and stems, the plants ought to have been taken at an earlier period, most probably when the seeds were ripe. The main object, however, being to examine the tuber, it was necessary to take the plants at the time when they are considered agriculturally mature.

Looking now to the composition of the plants, it is to be noted that the proportion of water contained in the tubers varies within

but narrow limits, and is not very different from that contained in the seed from which they were raised. The nitrogen and albuminous compounds, however, are almost invariably lower than in the seed potatoes, while the ash is practically the same. If in place of comparing the percentage composition of the tubers produced, we take the total produce, and calculate from it the amount of the different constituents yielded by an acre of land, the results are particularly interesting. The numbers are contained in the following table, of which the first column gives the total weight of produce in tons and cwts., the second the same in lb. avoirdupois, and the remainder the weight in lb. of each individual constituent contained in the produce:—

TABLE XIII.

Variety.	Manure.	Produce. In tons, &c. tons.	cwts.	lb.	Produce. In lb.	Water.	Albuminous Compounds.	Other Organic Matter.	Ash.	Nitrogen.
Dalmahoy.	None	9	9	30½	21,198.5	15,780.0	171.7	5022.2	224.6	27.6
	Super. & guano	11	4	79	25,169	18,038.6	251.7	6657.3	221.4	40.2
	25 tons dung	9	16	21	21,973	16,791.7	176.9	4783.5	221.9	29.5
	35 do.	10	7	48	23,232	18,167.4	116.1	4690.7	257.8	18.6
Regents.	None	7	6	7	16,359	12,323.2	142.3	3720.1	173.4	22.9
	Super. & guano	9	3	24	20,520	15,779.9	205.2	4328.7	207.2	32.8
	25 tons dung	8	4	24	18,392	14,060.6	240.8	3902.2	188.4	38.6
	35 do.	7	13	94	17,230	13,055.1	172.3	3814.8	187.8	27.5

The variation in the proportions of albuminous compounds shown in this table is very remarkable, and not easily explicable. Thus, for example, the addition of twenty-five tons of dung to the Dalmahoys produces no perceptible effect either on the total produce or the amount of albuminous compounds contained in it; while, in the case of the Regents, the increase of the total produce is only about an eighth, while the albuminous compounds rise from 142 lb. to 240 lb. It is remarkable also, that the application of 5 cwt. superphosphate, and 3 cwt. guano, which contains much less nitrogen than the farmyard manure, produces a much larger amount of nitrogen in every case, except that of the Regents with 25 tons dung. In considering these results, however, it must be borne in mind that the soil in which the potatoes were grown was very rich, and had been very liberally treated, so that the effect of the manures was somewhat modified by this circumstance.

COMPOSITION OF POTATOES GROWN AT DARGAVEL ON NEWLY RECLAIMED MOSS LAND, AND TAKEN IN 23D JULY.

XIV. TABLE giving the Weight of Tubers, Haulms, and Roots in Six Dalmahoys, and average for each Plant.

Manure.		No. of Tubers on Six Plants.	Average No. of Tubers on each Plant.	Diameter.	Weight of Six Plants.	Average Weight of each Plant.
4 cwt. superphosphate and 2½ cwt. guano,	Tubers,	40	6.6	1″ to ¼″	684.2	114.0
	Haulms,	...	...	...	8,170.0	1,361.6
	Roots,	...	...	...	1,125.6	187.7
	Total,	...	...	...	9,979.8	1,663.3
6½ cwt. superphosphate and 4 cwt. guano,	Tubers,	51	8.5	1″ to ¼″	849.4	141.6
	Haulms,	...	...	...	6,670.0	1,111.6
	Roots,	...	...	...	629.9	104.0
	Total,	...	...	...	8,146.3	1,357.2
25 tons dung,	Tubers,	56	9.3	1¼″ to ¼″	2,797.9	466.3
	Haulms,	...	...	...	8,7.0	1,461.6
	Roots,	...	...	...	924.5	154.1
	Total,	...	...	...	12,492.4	2,082.0
35 tons dung,	Tubers,	65	10.8	1½″ to ¼″	2,541.2	423.5
	Haulms,	...	...	...	10,740.0	1,790.0
	Roots,	...	...	...	994.9	165.8
	Total,	...	...	...	14,276.1	2,379.3
35 tons dung, and 2½ cwt. superphosphate (ordinary manuring of field),	Tubers,	85	14.1	1¼″ to ¼″	2,834.7	472.4
	Haulms,	...	...	...	15,650.0	2,608.3
	Roots,	...	...	...	811.3	135.2
	Total,	...	...	...	19,296.0	3,215.9

XV. TABLE giving the Amount of Water, Albuminous Compounds, other Organic Matters, and Ash in Dalmahoys, taken 23d July.

Manure.		Water.	Ash.	Other Organic Matters.	Albuminous Compounds.	Nitrogen.		Ash in Dry Substance.
						In Wet Substance.	In Dry Substance.	
4 cwt. superphosphate, 2½ cwt. guano,	Tubers,	82.18	1.95	15.17	.70	.31	1.74	3.89
	Haulms,	87.03	5.25	5.15	1.03	.84	6.81	8.84
	Roots,	88.84	2.37	8.07	.71	.38	3.47	6.41
6½ cwt. superphosphate, and 4 cwt. guano,	Tubers,	86.04	1.68	11.37	.50	.27	2.01	3.62
	Haulms,	89.08	3.68	5.16	1.07	.59	5.47	9.20
	Roots,	89.26	2.75	7.23	.65	.44	4.17	6.12
25 tons dung,	Tubers,	82.09	1.25	16.09	.56	.20	1.16	3.15
	Haulms,	89.31	3.25	5.72	1.61	.52	4.94	15.17
	Roots,	82.05	2.12	14.85	.92	.34	1.91	5.44
35 tons dung,	Tubers,	78.14	2.00	19.01	.84	.32	1.51	3.85
	Haulms,	90.05	3.37	6.82	1.28	.54	5.50	12.84
	Roots,	87.65	1.62	9.88	.85	.26	2.12	6.86
35 tons dung, 2½ cwt. superphosphate,	Tubers,	84.25	1.37	13.80	.64	.22	1.41	4.08
	Haulms,	90.91	3.25	3.57	1.26	.52	5.79	13.89
	Roots,	80.82	3.12	14.46	1.59	.50	2.62	8.34

XVI. TABLE giving the Weight of Tubers in Dalmahoy Potatoes, lifted 26th September.

Manure.	No. of Tubers on Six Plants.	Average No. of Tubers on each Plant.	Diameter.	Weight of Tubers.	
				On Six Plants.	Average on each Plant.
4 cwt. superphosphate and 2½ cwt. guano,	52	8.9	2" to ¼"	8100	1350
6½ cwt. superphosphate and 4 cwt. guano, . . .	39	6.5	2" to ¼"	8400	1400
25 tons dung, . .	55	9.1	3" to ¼"	18,270	3045
35 tons dung, . .	65	10.8	3" to ¼"	21,770	3628
35 tons dung and 2½ cwt. superphosphate, . . .	66	11.0	3" to ¼"	19,010	3145

XVII. Table giving the Amount of Water, Albuminous Compounds, other Organic Matters, and Ash in Dalmahoys, raised 26th September.

Manure.	Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen.	
					In Wet Substance.	In Dry Substance.
4 cwt. superphosphate and 2½ cwt. guano,	77.74	1.62	19.91	0.73	0.26	1.20
6½ cwt. superphosphate and 4 cwt. guano,	79.24	1.50	18.55	0.71	0.24	1.16
25 tons dung, .	78.87	2.31	18.10	0.72	0.37	1.77
35 tons dung, .	78.02	1.56	19.42	0.90	0.25	1.28
35 tons dung and 2½ cwt. superphosphate,	73.76	1.87	23.53	0.84	0.30	1.15

When the potatoes grown on moss were ripe the haulms had almost entirely died down, and no analysis of the entire plant could be made, neither was it then possible to determine the weight of the tubers in six plants, as had been done at the earlier stage, owing to the difficulty experienced in distinguishing those belonging to each individual plant. When the potatoes were dug, it was found that many of the tubers were detached from the roots, and as it was not easy to ascertain which belonged to particular plants, I was compelled to content myself with the analysis of the tubers alone.

XVIII. TABLE giving the Amount of Water, Albuminous Compounds, other Organic Matters, and Ash in the tubers of ripe Dalmahoys.

Manure.	Water.	Albuminous compounds.	Other organic matters.	Ash.	Nirogen.	
					In wet substance.	In dry substance.
None, ...	80.11	1.50	16.86	0.53	0.24	1.30
4 cwt. superphosphate and 2½ cwt. guano,	80.84	1.43	17.31	0.42	0.23	1.23
5 cwt. superphosphate and 3 cwt. guano,	82.86	1.31	14.39	0.44	0.21	1.27
6⅔ cwt. superphosphate and 4 cwt. guano,	80.84	1.56	17.56	0.44	0.25	1.32
25 tons dung, . . .	78.22	1.68	18.16	0.94	0.27	1.27
35 do., . . .	79.62	1.68	17.99	0.71	0.27	1.34
35 tons dung and 2½ cwt. superphosphate,	80.41	1.43	16.47	0.69	0.23	1.24

XIX. TABLE giving in lb. the Total Amount of Produce, and of Water, Albuminous Compounds, other Organic Matters, and Ash, from an Acre.

Manure.	Total produce.	Water.	Albuminous compounds.	Other organic matters.	Ash.	Nitrogen.
None, ...	1140	912.0	17.1	204.9	6.0	2.7
4 cwt. superphosphate and 2½ cwt. guano, .	4324	3443.2	56.6	800.6	23.6	9.0
5 cwt. superphosphate and 3 cwt. guano, .	3891	3190.6	53.3	618.7	28.4	8.5
6⅔ cwt. superphosphate and 4 cwt. guano, .	4170	3308.4	52.5	781.6	27.5	8.3
25 tons dung, . . .	10,890	8847.0	136.1	1816.6	90.3	21.8
35 do., . . .	11,569	9189.2	151.5	2143.8	74.5	24.2
35 tons dung and 2½ cwt. superphosphate,	10,997	8842.7	157.2	1921.3	75.8	25.2

XX. TABLE giving the Weight of Tubers, Haulms, and Roots in Regent Potatoes, grown at Dargavel, and lifted on 23d July.

Manure.		No. of Tubers on Six Plants.	Average No. of Tubers on each Plant.	Diameter.	Weight of Six Plants.	Average Weight of each Plant.
35 tons dung,	Tubers,	100	16.6	2" to ⅛"	4,949.2	824.8
	Haulms,	...	...	...	25,790.0	4,298.3
	Roots,	...	...	...	1,795.8	299.3
	Total,	...	...	...	32,535.0	5,422.4
25 tons dung,	Tubers,	64	10.6	1¼" to ⅛"	4,273.5	712.2
	Haulms,	...	...	...	8,260.0	1,377.0
	Roots,	...	...	...	1,195.7	199.3
	Total,	...	...	...	13,729.2	2,288.5
35 tons dung, and 2½ cwt. superphosphate,	Tubers,	110	18.3	2¼" to ⅛"	9,292.2	1,548.7
	Haulms,	...	...	...	23,160.0	3,860.0
	Roots,	...	...	...	2,147.8	358.3
	Total,	...	...	...	34,602.0	5,767.0
6½ cwt. superphosphate, and 4 cwt. guano,	Tubers,	20	3.3	1" to ⅛"	916.0	152.6
	Haulms,	...	...	...	6,170.0	1,030.0
	Roots,	...	...	...	597.4	99.7
	Total,	...	...	...	7,683.4	1,280.7
4 cwt. superphosphate, and 2½ cwt. guano,	Tubers,	34	5.6	1¼" to ⅛"	1,505.2	250.9
	Haulms,	...	...	...	5,116.8	852.8
	Roots,	...	...	...	694.4	116.7
	Total,	...	...	...	7,316.4	1,229.4

XXI. TABLE giving the Amount of Water, Albuminous Compounds, other Organic Matters, and Ash, in Regents, lifted 23d July.

Manure.		Water.	Albuminous compounds.	Other organic matter.	Ash.	Nitrogen. In wet substance.	Nitrogen. In dry substance.	Ash dry.
35 tons dung,	Tubers,	84.50	1.56	13.13	.80	.25	1.65	5.2
	Haulms,	91.42	2.43	5.18	1.36	.39	4.57	15.88
	Roots,	88.40	1.56	9.04	1.07	.25	2.19	9.18
25 tons dung,	Tubers,	80.56	1.31	17.38	.73	.21	1.11	3.80
	Haulms,	94.07	1.68	4.25		.27	4.59	
	Roots,	87.65	1.87	9.69	.78	.30	2.40	6.34
35 tons dung, 2½ cwt. superphosphate,	Tubers,	83.13	1.50	14.70	.66	.24	1.45	3.93
	Haulms,	90.19	2.93	5.77	1.10	.47	4.87	11.28
	Roots,	87.91	1.25	9.98	.85	.20	1.74	7.09
6 cwt. superphosphate,	Tubers,							
	Haulms,	86.97	4.63	6.65	1.14	.75	6.18	8.82
	Roots,	72.06	4.00	22.33	1.50	.64	2.30	5.73
4 cwt. superphosphate, 2½ cwt. guano,	Tubers,	81.06	1.87	16.38	.68	.30	1.61	3.72
	Haulms,	86.74	5.00	7.12	1.15	.80	6.08	8.70
	Roots,	87.57	2.43	8.39	.46	.39	3.19	3.45

XXII. TABLE giving the Weight of Tubers in Regent Potatoes, lifted 26th September.

Manure.	No. of Tubers in Six Plants.	Average No. of Tubers on each Plant.	Diameter.	Weight of Tubers on Five Plants.	Average Weight of Tubers on each Plant.
35 tons dung, . . .	96	16	2" to ¼"	25,600	4266
25 do., ...	61	10.1	3" to ¼"	19,400	3233
4 cwt. superphosphate, 2½ cwt. guano, .	35	6	3" to ¼"	10,100	1683
35 tons dung, 2½ cwt. superphosphate, .	79	13.1	2" to ¼"	25,040	4173
6½ cwt. superphosphate, 4 cwt. guano, . .	35	6	2" to ¼"	9100	1516

XXIII. TABLE giving the amount of Water, Albuminous Compounds, other Organic Matters, and Ash in Regents, lifted 26th September.

Manure.		Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen.		Ash in Dry Substance.
						In Wet Substance.	In Dry Substance.	
35 tons dung, . . .	Tubers,	78.02	1.56	19.42	.90	.25	1.23	
25 tons dung, . . .	Tubers,	78.87	2.31	18.10	.72	.37	1.77	
4 cwt. superphosphate, 2½ cwt. guano, . .	Tubers,	77.74	1.62	19.91	.73	.26	1.20	
35 tons dung, 2½ cwt. superphosphate, .	Tubers,	73.76	1.87	23.53	.84	.30	1.15	
6½ cwt. superphosphate, 4 cwt. guano, . .	Tubers,	79.24	1.50	18.55	.71	.24	1.16	

XXIV. TABLE giving the Amount of Water, Albuminous Compounds, other Organic Matters, and Ash in ripe Regents.

Manure.	Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen.	
					Wet.	Dry.
35 tons dung,	79.43	1.31	17.59	.67	.21	1.02
25 tons dung,	81.24	1.25	15.68	.83	.20	1.07
35 tons dung, 2½ cwt. superphosphate, .	77.25	1.43	20.55	.77	.23	1.02
6½ cwt. superphosphate, 4 cwt. guano, .	79.34	1.25	18.75	.66	.20	.97
4 cwt. superphosphate, 2½ cwt. guano, ...	80.02	1.31	18.11	.56	.21	1.12
None, ...	78.97	1.43	19.85	.65	.23	1.08
5 cwt. superphosphate, 3 cwt. guano, . . .	81.96	1.37	17.94	.73	.22	1.10

XXV. TABLE giving the Total Amount of Produce, Water, Albuminous Compounds, other Organic Matters, and Ash, from an acre of Regents, in lb.

Manure.	Total Produce.	Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen.
None, ...	680	537.2	9.7	128.7	4.4	1.5
4 cwt. superphosphate, 2½ guano, ...	4132	3305.6	54.1	749.2	23.1	8.6
5 cwt. superphosphate, 3 guano,	3836	3145.5	52.5	610.0	28.0	8.4
6¼ cwt. superphosphate, 4 guano, . . .	3632	2881.6	45.4	681.1	23.9	3.5
25 tons dung, . .	9290	7547.1	116.1	1549.7	77.1	18.6
35 do. . .	9623	7643.5	126.0	1790.1	63.4	20.2
35 do. and 2½ superphosphate, . . .	10016	7737.3	143.1	2058.6	77.0	23.1

In discussing the results of the field experiments in the first part of this paper, reference has been already made to the remarkable fact that on moss land the produce is entirely dependent on the manure, and that practically nothing is extracted by the plants from the soil itself. This fact is made still more conspicuous by the analytical numbers. Looking to the nitrogen, for example, it appears that the entire amount of that element found in the unmanured Dalmahoy potatoes is 2.7 lb., and in the Regents only 1.5—a quantity which, in all probability, falls short of that contained in the seed-potatoes. It is to be regretted that the weight per acre of seed-potatoes used was not determined, as it was not expected that it would be of importance in relation to the results. Even where manures are employed it is interesting to observe how small is the proportion of the nitrogen they contain which finds its way into the plant. Thirty-five tons of dung produce a crop containing only from 20 to 25 lb. of nitrogen, although it must have supplied to the soil from 450 to 500 lb. of nitrogen, or more than twenty times as much as the crop assimilated. Nor must it be forgotten that a part of this nitrogen must be derived from the air, although it is not possible to determine what proportion is so obtained. What is true of nitrogen applies with equal or even greater force to the inorganic matters, which, in the case of the Regents, are raised by manure from 4.4 to 77.0 lb.—the whole of the surplus in this case being, of course, derived from the manure. It is interesting to notice, also, how small is the influence which the manure exercises on the percentage composition of the potato—in which respect there is a marked difference between it and the turnip—the analysis recorded in the Transactions having shown that the difference in the composition of that root when raised by different

manures is so great as to render it impossible to estimate its feeding quality from the weight of the crop alone. With the potato this is quite possible.

Although it was not intended to have made analyses of the other varieties of potatoes used in the experiments, those grown at Dargavel were examined. It will be remembered that they were all grown with the ordinary manuring of the field—viz., 35 tons dung and 2½ cwt. of superphosphate—an unusually liberal application, but one which the previous experience of the tenant showed to be most remunerative.

XXVI. TABLE giving composition of four varieties of Potatoes grown at Dargavel.

	Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen. In Wet Substance.	Nitrogen. In Dry Substance.
Flukes, . .	79.18	1.62	18.44	0.66	0.26	1.28
Skerry Reds,	78.79	1.81	18.69	0.71	0.29	1.39
White Rocks,	77.91	1.68	19.41	1.00	0.27	1.23
Orkney Reds,	79.45	1.75	18.25	0.55	0.28	1.39

XXVII. TABLE giving the produce in lb. of four varieties of Potatoes.

	Total Produce.	Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen.
White Rocks,	13,003	10,130.6	218.4	252.4	130.0	35.1
Flukes, . .	4,469	3,538.5	72.4	828.6	29.5	11.6
Skerry Blues,	7,544	5,944.6	136.5	1142.6	320.3	21.9
Orkney Reds,	10,490	8,334.3	183.5	1914.5	57.7	28.6

These results call for little special remark, excepting that they show how small is the difference in composition of the different varieties of potatoes. The water, it will be observed, is invariably higher than in the seed-potatoes; but it must be borne in mind that the latter had been kept for a whole winter previous to analysis, while the former were examined as soon as removed from the soil.

EXPERIMENTS MADE AT CROSSBURN, TROON.

In this case the analyses were only made on the ripe potatoes, and no estimate was made of the number of tubers on each plant.

XXVIII. TABLE giving the amount of Water, Albuminous Compounds, other Organic Matters, and Ash, in Potatoes grown at Troon.

Variety.	Manure.	Water.	Albuminous Compounds.	Other Organic Matter.	Ash.	Nitrogen. In Wet Substance.	Nitrogen. In Dry Substance.	Ash on Dry Substance.
White Rocks,	15 tons dung,* 2½ cwt. superphos.,	74.22	1.62	23.06	1.10	.26	1.01	4.11
Flukes, . .	do. do. . .	76.77	1.56	19.41	1.16	.25	1.17	5.01
Skerry Blues,	do. do. . .	73.22	2.00	23.69	1.09	.32	1.20	4.08
Orkney Reds,	do. do. . .	74.38	1.81	22.68	1.12	.29	1.16	4.38
Regents, . .	None, ...	71.75	2.00	25.12	1.13	.32	1.15	4.01
Do. . .	3 cwt. guano, 2½ cwt. superphos,	72.08	1.87	24.75	1.30	.30	1.10	4.66
Do. . .	25 tons dung, . .	76.47	1.50	21.10	.92	.24	1.02	3.99
Do. . .	35 do. . . .	75.24	1.56	21.92	1.28	.25	1.03	5.18
Dalmahoys, .	None, ...	74.85	1.68	22.62	.85	.27	1.11	4.15
Do. . .	3 cwt. guano, 2½ cwt. superphos.,	77.88	1.56	19.44	1.12	.25	1.14	5.09
Do. . .	25 tons dung, . .	77.00	1.50	20.40	1.10	.24	1.08	4.80
Do. . .	35 do. . . .	73.06	1.87	23.85	1.22	.30	1.13	6.37

XXIX. TABLE giving the total produce of Water, Albuminous Compounds, other Organic Matters, and Ash.

Variety.	Manure.	Total Produce.	Water.	Albuminous Compounds.	Other Organic Matters.	Ash.	Nitrogen.
White Rocks,	15 tons dung, and 2½ cwt. superphosphate, .	14,757	10,951.5	239.0	3604.2	162.3	38.3
Flukes, . .	...	7,726	5,931.2	120.5	1584.7	89.6	19.3
Skerry Blues, .	...	14,284	10,458.7	285.6	3384.0	155.7	45.7
Orkney Reds,	...	13,798	10,262.9	249.7	3131.0	154.5	40.0
Regents, . .	None, . . .	7,066	5,069.8	141.3	1765·1	79.8	22.6
Do. .	3 cwt. guano, and 2½ cwt. superphosphate, .	11,326	8,166.0	201.8	2711.0	147.2	33.9
Do. .	25 tons dung, .	10,941	8,366.6	164.1	2509.8	100.5	36.2
Do. .	35 do.,	9,872	7,427.6	154.0	2165.1	125.3	24.6
Dalmahoys, .	None, . . .	8,370	6,264.9	140.6	1893.4	71.1	20.0
Do. .	3 cwt. guano, and 2½ cwt. superphosphate, .	12,369	9,646.2	192.9	2341.4	138.5	30.9
Do. .	25 tons dung, .	11,922	9,179.9	179.8	2421.2	131.1	28.6
Do. .	35 do.,	11,202	8,188.6	209.5	2667.3	136.6	33.6

* In the first part of this paper, in giving the results of the field experiments, there is a typographical error—the amount of dung being set down at 65 tons in place of 15. Although the reader can have no difficulty in seeing that this is an error, reference being made to the 15 tons of manure in the text, it is well to notice and correct it.

The results of these experiments show much greater differences in the composition of the produce than are observed in either of the other series, and the cause is probably due to the nature of the soil, which was of a kind much more favourable for bringing out the differences occasioned by manures. In the other series, the soils might be described as extremes—that at Woolmet being both naturally rich and in the highest condition, while the newly reclaimed moss at Dargavel is naturally of the poorest description, and by itself is almost entirely incapable of producing a crop. It is especially worthy of notice that the Regents and Dalmahoys, without any manure, contain much less water than those which have been heavily manured; and hence it appears that, though the crop of Regents yielded by 25 tons of farmyard manure is nearly double the weight of that obtained without any application, its nutritive value is not proportionally increased. The albuminous compounds especially have increased only from 141 to 164 lb., or by only a seventh. A similar though rather less marked effect occurs with Dalmahoys. The only exception to this general statement is found in the case of the last variety, with 35 tons of farmyard manure, the produce from which contains an unusually small percentage of water. The difference in this case is so marked, that I cannot help imagining that some error may have occurred in the analysis. Unfortunately, from the nature of the experiments, it is impossible to trace an error unless it is detected at the time; and there is, in reality, nothing to lead me to suppose that there is a mistake, except the discrepancy of the result. It is equally likely that the analysis is correct, and that it is due to some other cause.

Taking the results of these investigations in the field and in the laboratory as a whole, it is clear that they offer much interest, both in a practical and a scientific point of view. They illustrate very forcibly the difficulties and uncertainties which beset such experiments, and must always occur in agricultural inquiries. In this particular case the results are rendered of less general interest than they otherwise would be, by the unfortunate character of the season in which they were made, which was peculiarly unfavourable to the potato. In some of the experiments (and this applies more particularly to those made at Troon) the produce was not more than half what would have been obtained in an ordinary year; and even at Woolmet the crop was not large when the quality and condition of the soil are taken into account. It is very probable that, had the season been favourable, the results would have been of a very different character, and might lead to very different conclusions. Taking the results as they stand, they are unquestionably in the highest degree unfavourable to excessive manuring—the produce from 35 tons of manure being, both at Woolmet and Troon, considerably smaller than from 25 tons, and at Dargavel the increase is a mere trifle; and it may be safely said, that in all cases where

35 tons of farmyard manure were used, 10 tons were thrown away. But are we entitled to infer that this result would always be attained? May it not be that, owing to the unfavourable nature of the season, the crop was unable to take advantage of the manure supplied to it as it would have done had the weather been drier and more genial? To answer this question, the same or similar experiments would have to be repeated for several successive years. In doing this, it is probable that so many minute data would not be required; the analyses, at least, might be restricted to the determination of water and nitrogen in the crop and the seed, and, if this were done, there would be no great difficulty in making them, whereas analyses of such minuteness as many of those contained in the preceding pages must necessarily be limited in number. It is probable also that, going on the experience of those already made, a better series of experiments might be devised for future years. I trust that I may have an opportunity of prosecuting this subject still further, and I shall be glad to co-operate with any one who proposes to make experiments. The effect of large manuring might well give rise to further inquiry; and the effect of salts of potash on the potato is well worthy of investigation. Those who are interested in this subject would do well to refer to some experiments recorded in the Transactions some years since, in which muriate of potash produced a most remarkable effect on the potato in one season, while in the next it gave a regular result. Many other subjects of a similar kind might be examined by those interested in such inquiries, and I trust that any one making such experiments will communicate the results to me.

ON THE COMPOSITION OF SOME FEEDING STUFFS.

During the last few months, several substances used for cattle-feeding have been analysed in the laboratory, and have given results of sufficient interest to merit the attention of members of the Society.

Palm Kernel Cake.—A sample of this cake was recently sent to the laboratory, but without any information as to the source from which it was obtained. Its composition was—

Water,	10.76
Oil,	11.40
Albuminous compounds,	13.37
Sugar, mucilage, &c.,	27.45
Fibre,	33.01
Ash,	4.01
	100.00
Nitrogen,	2.14

The ash contained—

Earthy phosphates,	1.65
Phosphoric acid, in combination with alkaline,	0.76
Sand,	0.74

Though not by any means of high quality, this cake appears worthy of attention as an addition to the number of feeding substances. It will not, of course, bear comparison with linseed-cake, or even with cotton-cake in point of nutritive value; but, at the price at which it is sold (£5, 10s. per ton), it may be used with advantage. It contains only half the amount of albuminous compounds which are found in a good oil-cake, and it is also very inferior in respirating principles (sugar, mucilage, &c.,) though quite equal to it in oil. The quantity of fibre is also large, and this is so far a disadvantage, as it protects from digestion substances which might otherwise be assimilated; but, notwithstanding all this, there can be no doubt that the substance merits attention. Although I have no information regarding the source of this cake, I presume it is the residue obtained in making palm oil, or cocoa-nut oil, the production of which is carried on on a very large scale, and the quantity of cake annually produced must be very large. Unfortunately the oil is expressed in a very rude manner, and on a small scale, so that a very large proportion of the cake produced is no doubt lost, and will probably remain unavailable to agriculture for a long time. Its collection and importation might be worth the attention of merchants residing near where these oils are produced.

Oat-Dust.—So far as I know, there is only one analysis of oat-dust on record, made at a time when it was not customary to determine the amount of fibre. That which follows may, therefore, be considered of interest:—

Water,	5.59
Oil,	3.63
Albuminous compounds,	4.81
Starch, sugar, &c.,	45.76
Fibre,	35.31
Ash,	4.90
	100.00
Nitrogen,	0.77

The ash contains—

Phosphoric acid,	0.65
Sand,	2.74

Compared with the previous analysis, to which reference has been made, this sample is poorer in albuminous compounds, and rather richer in oil; but the difference is not great, nor more than might be expected in different samples of the same substance. Its feeding value ought to be nearly one-fourth of that of the oat itself; and, as its price is low, it must be an economical food. On the other hand, it must be borne in mind that it is one of those substances which are apt to promote the formation of intestinal concretions, and it must, therefore, be used with caution, and should form only a small part of the food of the animals to which it is given.

Distillers' Pot Ale or Dreg.—This substance is largely used in many places in feeding stock, and more especially for milch cows in and near towns, and its value is therefore a matter of much importance, especially as its quality differs greatly. There are two processes of distillation now in use—the old process, by means of which malt spirit is obtained, which has undergone no change during the last 20 or 30 years, and the process of making grain spirit, which is now conducted in a kind of still, known by the name of Coffey's still, of a construction entirely different from that of the old still, and in which the distillation is conducted by means of steam. It is unnecessary to describe the process of distillation further than to remark that the latter is a continuous process. I have had occasion recently to analyse the pot ale obtained by both processes in the same work, and the results are of importance as indicating a great difference in the feeding value of the two kinds. The results give the quantities in grains per gallon.

	Malt.	Coffey's Still.
Albuminous compounds,	853.43	536.06
Other organic matters,	1752.09	1119.59
Oils,	281.48	177.95
	2887.00	1853.60
Nitrogen,	136.55	88.97
The ash contained—		
Phosphates,	50.52	60.24

These numbers speak for themselves, and show that the malt pot ale is greatly superior to the other, its nutritive value being half as high again. The question has occurred whether these substances contain any matters likely to be prejudicial to stock, and in this respect they were very carefully examined, and found to contain no such substances. A little spirit remains in both, but its quantity is very trifling; and there is also a small quantity of the peculiar oil called fousel oil, which is generated during fermentation. I have been informed that the use of pot ale is attended with diuretic effects in some cases, and it is possible that this may be due to the fousel oil; but I have never heard of any experiments, either on man or animals, which bear upon the subject. It would be interesting to know whether diuretic effects are invariably or frequently found to follow the use of pot ale. Any information on this point would be valuable.

COMPARATIVE VALUE OF THE DIFFERENT GRASSES.

By Archibald Sturrock, Kilmarnock.

[Premium—£20.]

(*Concluded from page* 280.)

FIORIN, OR SPREADING BENT-GRASS

(*Agrostis stolonifera* or *A. alba*, var. *stolonifera*, of the tribe *Agrostideæ*).

The *true Irish fiorin-grass*, being the *broad-leaved* variety known as *A. stolonifera*, var. *latifolia*.

Panicle large and erect, spreading, and the lowermost branches more or less tufted; spikelets small and very numerous, of one awnless floret; sheaths generally roughish when felt from above downwards; ligule long.

This is an aquatic species of grass of the Bent family. It is easily known from other species of bent-grasses by its large, spreading, dingy-purple panicle, in the leaves being longer and *broader*, and the joints more distant and of a brownish purple colour. The root is perennial and fibrous, and its stems are *decumbent at the base*, and *stoloniferous*. The root-fibres are rather short, and penetrate but a short way into the soil; and the stolones grow out in the same manner as strawberry-shoots, strike root at their joints, are very plentiful, and multiply the grass with great rapidity. Fiorin grass was introduced, or rather brought prominently into notice as an agricultural hay-grass for certain soils, some forty years or more ago. Previously it was known in common with others of the Bent genus only as a better kind of grass weed. Different opinions are still held in regard to its value as a grass for meadow purposes. If cultivated for hay, it labours under some serious practical defects. Containing, as it does, most nutritive matter when the seeds are ripe, it is desirable that the grass should be pretty well matured before being cut down; but through its late growth, not ripening its seeds till near the middle of September, the season has advanced to such a late period ere the grass is ready for the scythe, that it is a difficult matter then to get it made into hay; besides, the stems lying so decumbent, and the whole mass of herbage being much matted together by creeping stolones, it is found a rather difficult affair to get it mown at all. The amount of nutritive elements, in proportion to the bulk of fiorin, also, is smaller than in most other aquatic grasses. For to grow it successfully, it seems to require a free open soil with much peat in its composition, and to be kept constantly under irrigation from running water. Upon the whole, it may be said that the fiorin grass, *as a main ingredient*, does not possess general adaptation for the majority of

meadows; but may, *as such*, be cultivated advantageously upon some of the wet peaty soils of our west coast, and where also it has that humid atmosphere under which it seems to thrive best. Its chief advantage as a small ingredient in a mixture of grasses is *late growth*—the latest mouthful of herbage in the season being afforded by this grass. Seeds of the fiorin rate from 6d. to 8d. per lb.

The fiorin grass is generally considered only a stronger-growing, larger-leaved *variety* of the *Agrostis alba*, or marsh bent, and is almost the only one in the family *Agrostis* deserving notice on account of agricultural merits: even of it, too, there are some *sub-varieties*, which are of less value and more common in Britain than the *true Irish* broad-leaved and dark-panicled *A. s.* var. *latifolia*. The bent grasses in general are of a most innutritious nature, and none of them are relished or ever eaten by cattle if anything better in the shape of pasturage can be got.

The common or fine bent-grass, *A. vulgaris*, as well as most of the other species, are known to arable-land farmers as very annoying weeds, under the names of "twitch-grass," or "quicks," from the rapidity with which they spread themselves. The common species has long creeping roots, and grows naturally in sandy soils; it is sometimes of service in forming a sward upon dry parched lands, or very gravelly spots, where few other sorts of plants will grow.

A separate species with some, but, properly speaking, only a robust-growing *variety* of the common bent, the *Agrostis dispar*, herd-grass or red-top grass, is extensively cultivated in some parts of America, and also in the south of France; but however well it may succeed on dry soils, under comparatively warm climatic influence, it has not yet been found but a slight degree better than the common bent, either for pasture or hay, in our climate; it can be recommended only for cultivation on light dry soils, and also upon *grey-land* near the moor-edge. Red-top or herd-grass seeds can be had now at or under 1s. per lb.

WOOLLY OR MEADOW SOFT-GRASS

(*Holcus lanatus*, of the tribe *Avenaceæ*).

Known also as "white hay" and "Yorkshire fog," and commonly in Ayrshire and the west as "hose-grass" or "haze-grass." Panicle erect, crowded, close in the young state, but afterwards open and spreading, of a soft woolly appearance, and varying in colour from a whitish-green to a whitish-red—more commonly the latter; spikelets of two florets on short hairy footstalks; upper floret the smallest, with a short awn, which becomes recurvous when the seed is ripe; lower floret awnless; calyx of two nearly equal hairy glumes; root fibrous and perennial.

This grass is of very frequent occurrence on all sorts of pasture-

land throughout Britain, but more common on light inferior soils, and especially on such as are damp and of a peaty or moorish nature, or on what is called *grey-land*. Its culms are numerous and erect, and grow to a height of from 18 inches to 2 feet; and the whole plant, but chiefly the leaves and sheaths, is of a *very soft downy* composition. The woolly soft-grass yields a very large bulk of herbage, or rather *foggage*, but which is of a most insipid innutritious kind, and is much disliked by cattle—particularly by horses, being little eaten by them either in a growing state or as hay. It appears to be only eaten through excess of hunger, when the beasts cannot get *anything better* from the absence or deficiency of more palatable and nutritious herbage plants.

The *insipidity* of the woolly soft-grass when made into hay may be lessened by sprinkling salt over the hay when stacking it; but no remedy is available in its growing state, and it therefore ought to be excluded from pasture-fields as much as possible, by having its seeds thoroughly cleaned out from amongst the ryegrass or other grass seeds before sowing. It is observable that all those grasses which have their sheaths and foliage much covered with hairs, or of soft downish nature, are more or less innutritious and disliked. The only merit to which the woolly soft-grass can lay claim is, that it is very easy of cultivation, and will grow almost anywhere; but it cannot be recommended for culture, except on wet mossy moors or other inferior soils of a peaty or greyish character, upon which herbage of any kind is desirable.

It is a common practice with some of the ryegrass-seed raisers of the west country to scatter over their *deficient* first year's pasture a quantity of the chaff which had been blown out from amongst their ryegrass—consisting often in great part of hose-grass or white-hay seeds; such will no doubt soon give their fields a *rough* enough appearance, but that is about the only good which they effect. It may perchance, too, sometimes happen that a small portion of the hose-grass seeds are those of the *creeping-rooted species*, noticed after; and farmers are thus just undoing their work by replacing in the soil those very *couchgrass roots* which it cost them so much labour and expense to get cleared out a year or two previous.

This species flowers from middle of June till July, and ripens its seeds about the second week of July and onwards. The *bare* seeds are shaped much like those of timothy, but smaller, and having a shining skin; they, however, very seldom separate from the woolly glumes, and thus conjoined they weigh about 6 to 7 lb., and can be had at from 1s. to 1s. 6d. per bushel.

The other native species of the *Holcus* family, *H. mollis* (creeping soft-grass) is distinguished in being more *slender* and less hairy, sending up fewer and *longer* culms, with an opener panicle, broader foliage, and *powerfully-creeping roots;* the large *glume* of the calyx is also more *acute*, and the smaller *upper* floret is furnished with a

long straight awn, never becoming curved—hence sometimes called bearded soft-grass. Its long creeping roots bear the popular and ignominious name of "couchgrass" in common with those of the *Triticum repens:* on light lands they sometimes reach a length of 3 to 4 feet, and are very impoverishing to the soil. This grass is considered, and justly, as a most noxious weed, and a pest in cultivated lands, and is with difficulty eradicated. It is most common on barren sandy soils, and neither cows, horses, nor sheep eat it. Although frequent in some districts, it is not nearly so prevalent as the other species, and is usually rather later of coming into flower. The long roots, like those of the creeping wheat-grass, contain a considerable quantity of nutritive matter, resembling in flavour new-made meal, and swine are found to eat them greedily.

MEADOW BARLEY-GRASS

(*Hordeum pratense*, of the tribe *Hordeaceæ*).

Inflorescence spiked; spikelets arranged in threes on each notch of the rachis, of one perfect floret each, the central floret being only perfect, and terminating in a long rough awn, the lateral florets imperfect or barren; glumes rough, bristle-shaped, and awned; root perennial and fibrous.

This grass is somewhat common in some parts of England upon *moist* meadows and pastures, but is rarely to be met with in Scotland. The culms have a height of from 18 inches to 2 feet. It is of hardy habits, and well adapted for irrigation, containing also a large proportion of nutritious matter. However, it yields but a small bulk of herbage in comparison with some grasses equally well suited for irrigated meadows; is liable to what is called *rust* disease; its seeds are only to be had in small quantity; and, lastly, its *long sharp bristle-like awns* are often the cause of irritating and inflaming the gums of cattle: on all these accounts it can scarcely be recommended for cultivation. It is said, however, to form the principal herbage in some famed *pastures* of Norfolkshire, considered *excellent for sheep.* It blooms from end of June till beginning of July, and ripens its seeds early in August. The seeds rate at from 1s. 3d. to 1s. 6d. per lb. The genus *Hordeum* includes other three native grass species besides the foregoing—viz., *H. murinum* (wall barley), *H. maritimum* (sea barley), and *H. sylvaticum* (wood barley). These are all rare in Scotland—not very frequent either in England; and it is just as well that such is the case, because, being furnished with *longer* and *rougher* bristly awns than even *H. pratense,* when mixed with hay they almost cannot fail to irritate the gums of horses and cows to such an extent as to cause inflammation. Their agricultural value may be put down as zero.

The tribe of the *Hordeaceæ* consists of four genera—viz., *Hordeum, Lolium, Elymus,* and *Triticum.* The third genus *Elymus*

is of two native species, one of which, however, is extremely rare, being found in only one or two localities on the English coast. This species, the *E. geniculatus* (pendulous sea lyme-grass), is known from the common one by its larger size, longer and more open spike, and which (the spike) is *bent towards the base,* and *points* nearly perpendicularly *downwards.* The common species, *E. arenarius* (upright sea lyme-grass), is found growing very frequent on nearly all parts of the sea-shore around this island. Its root is perennial and *extensively creeping.* The stems grow from 2 to sometimes even 5 feet in height, ending in a *dense spiked inflorescence* of from 4 to 8 inches in length, and about half-inch wide. The sea lyme-grass is often found growing in company with the sea reed-grass, noticed farther on, and which it somewhat resembles. The former is distinguished from the latter in its *ligule* being very *short* and *obtuse,* and the *spikelets without footstalks,* consisting of three or four florets; whereas the sea reed-grass has the *ligule long* and *pointed,* the spikelets with short footstalks and of only *one* floret. Both stems and foliage of *E. arenarius* are excessively hard and coarse, and are not eaten by any of our domestic animals in a growing state; however, as it is shown by analysis that this plant contains nearly one-third of its weight of saccharine matter—hence sometimes termed the sugar-cane of Britain—its hay, if cut down to small pieces and boiled with corn or other food, ought to be found very nourishing. The sea lyme-grass may be said to be chiefly important through its powerful creeping roots—these being of great value in arresting the spreading of the loose blowing sand of the sea-shore.

The grasses proper of the remaining family in the tribe (*Triticum*) are nearly all worse than worthless for any agricultural properties. The common creeping wheat-grass, *T. repens,* is better known to farmers as "couchgrass" or "quickens," and its roots are the most troublesome and hurtful plagues in arable land that the farmer has to contend with. Its inflorescence is *spiked,* as in the ryegrass, with the spikelets arranged alternately on each side, but the florets and glumes placed contrary to those of the ryegrass—viz., with their edges to the rachis; it has *two glumes* of equal size, and acute. The "couchgrass" is *too well known* to require any further description; yet this much-maligned grass is stated by chemists to possess in its roots three times as much nourishment as what the stems and leaves have. The long fleshy roots, say they, if washed, cut up, and boiled, are then sweet and wholesome, and eagerly eaten by cows and horses: the process might easily be tried, as they are only too plentiful in many districts. The *T. repens* is known also in some parts as "dog-grass," from the fact of dogs being seen frequently to eat its leaves—medicinally, it is supposed, to excite vomiting; and if it has this effect upon dogs, no wonder that it is so instinctively avoided by cattle.

Another species, the *T. caninum* (bearded wheat-grass), is perhaps the only member of the family deserving attention through agricultural merits. It much resembles the preceding species, but differs in the florets being furnished with long, slender, roughish awns—*longer than the palea*—and in its *root* being *fibrous*. The *T. caninum* affords a considerable quantity of nutritive herbage *early* in spring, although rather late in flowering, and it continues to grow also freely during the summer and autumn months. It succeeds well enough on all soils, except very wet stiff clays; and though not greatly relished perhaps, it is eaten by horses, cows, and sheep. However, it is much liable to be injured by *rust* disease, but this might be partly overcome by careful cultivation and proper selection of soils.

All the other species of the *Triticum* genus lie under the ban of the farmer, as troublesome weeds and impoverishers of the soil.

TAPER FIELD BROME-GRASS

(*Bromus commutatus*—the *B. arvensis* of some—of the tribe *Festucaceæ*).

The brome-grasses are better known popularly, in the west country at least, as "goose-grass."

Panicle large, loose, and spreading; glumes two and unequal; outer pale of floret bifid—*i.e.*, cleft into two points at the summit—and always with an awn arising from immediately under the two points; ligule of upper sheath prominent; root annual and fibrous.

All the species of the *Bromi* are, without exception, of a most innutritious nature, and some of them can be classed only as injurious weeds. The above species is the best in the family; and although comparatively an unproductive grass, it yet possesses a few qualities entitling it to notice. It is of hardy habit, and stands well through the winter, coming away early in spring; has short fibrous roots, which do not exhaust the soil; and it readily propagates itself from its seeds without aid, producing a good quantity of large-sized seeds, which shake off easily when ripe. It is useful, to a certain extent, for single crops of hay, particularly on *upland* farms, and ought to be taken whilst in a green state, as it contains (to say the best we can for it) some little nourishment, if cut at the time of flowering, but the hay is almost entirely worthless if left unmown till the seeds are ripe.

The different species of this genus are somewhat closely allied, and difficult to distinguish without some practice in botany; but it is of little consequence, as none of them can be recommended, and the greater part should be treated only as weeds. There are in all twelve native species, with varieties. The most common of these, besides the preceding, are *B. mollis* (soft brome-grass—called "lop" in some parts of England), and *B. racemosus* (smooth brome-grass). These two are both very unproductive and innutritious, and are often

only too plentiful amongst ryegrass hay-crops—a complete separation of their seeds from those of the rye-grass not being easily effected by the common wood ryegrass sieve, although it can be done almost perfectly with a wire-sieve machine. The brome-grasses bloom from beginning till middle of June, and ripen their seeds early in July. Quantities of the seeds are raised sometimes on upland farms in Ayrshire, in combination with ryegrass, from which they are afterwards separated; consisting mostly of a mixture of the three species mentioned above; and such mixture of brome or "goose-grass" seeds is retailed out at from 1s. 6d. to 2s. per bushel.

The ryeseeded brome-grass (*B. secalinus*) is not so common as those already mentioned, but is a troublesome weed to farmers when it gets into wheat and rye fields; the seeds of this species, when fully ripened, resembling those of rye, and possessing much the same deleterious properties as those of the bearded darnel, imparting a bitter taste to flour when ground along with grain. It is known by the panicle drooping much when the seeds are ripening, the spikelets consisting only of four or five florets, and the outer pale of the floret being more *rounded at the summit.* Another species, the *B. sterilis* (barren brome-grass), which has the florets furnished with *very long* rough awns, and the panicle much drooping, is known in some districts as "drank," and can only be put down as worthless.

The brome-grasses are somewhat nearly allied in their *botanical characters* to the broad-leaved fescues; but however much this may be the case, there is an immense difference between the two families in their nutritive and economical values, and comparative merits as hay and pasture grasses,—the fescues ranking amongst the most superior for these purposes.

REEDLIKE CANARY-GRASS

(*Phalaris arundinacea*, of the tribe *Phalarideæ*).

Placed also by some botanists as *Arundo colorata.* Panicle long, narrow, crowded, close at first, afterwards more spreading, and of a brownish-red colour, with shades of green and yellow; spikelets numerous and crowded, of one awnless floret; base of floret furnished with two linear tufts of hairs; root perennial and fibry-creeping.

This grass is rather frequent in Scotland, growing naturally on alluvial clayey soils by river-sides and the margins of lakes, and always close to the water. Its culms are erect and smooth, growing to a height of from 4 to 5 feet, and covered with long sheaths, embracing nearly the whole of the stem. The long cord-like roots are much covered with short fibres, and have often lateral suckers growing out from them. Both root-leaves and stem-foliage are produced in *large abundance,* of a rather harsh feel and light-green colour, but con-

taining an average proportion of nutritive matter. From the harshness of its herbage and reediness of its stems, *P. arundinacea* is generally refused by cattle in a growing state; still, when made into hay and cut up into small pieces for *boiling*, and used in a boiled state with other food, it is then readily eaten, and is nourishing. It is best suited for tenacious clayey soils; and to grow it for hay upon marshy lands of a clayish nature, or if even having a clayish subsoil, it certainly merits a much greater degree of attention than it has yet received from cultivators. It will yield, on suitable lands, three cuttings during the season; and a few pounds of its seeds might be beneficially flung in, to the greatly increased bulk of produce, upon meadows under irrigation of a stiffish nature, or having at least a clayish substratum. This species flowers in July, and ripens its seed about the middle of August; the seeds are similar in appearance to canary bird-seeds of the shops, but much smaller in size, and their price is from 1s. to 1s. 4d. per lb. A variegated variety of this species is well known as an ornamental garden-grass under the names of "gardeners' garters" and "ribbon-grass."

The *Ammophilla arundinacea* (Sea reed) is also ranged under the tribe *Phalarideæ*, and which it completes. The sea reed, in some of the older botanical works, is placed as *Arundo arenaria* and *Psamma arenaria*; and is also known as sea mat-grass, or *mat-weed*. It has a height of 18 inches to 2 feet, and its root is perennial and extensively creeping. This grass is of no good for agricultural cultivation. Like the sea lyme-grass it is only useful for retaining and fixing the drift-sand alongst the sea-coast; forming an embankment against the encroachments of the sea, and preventing the blowing of the loose sand over the more inland arable soil. The sea reed-grass makes an excellent and durable thatch, and it is said to yield a fibre almost equal to that of flax.*

THE COMMON REED

(*Arundo phragmites*, of the tribe *Arundinaceæ*).

This genus now forms a tribe by itself in the botany of the British native grasses. It is found growing by river-sides and the margins of lakes, but in the greatest perfection on rich alluvial deposits which are occasionally flooded by fresh-water tides, as on the north banks of the Tay, in the Carse of Gowrie. It is the tallest of all the British *gramineæ*, the stems often reaching a height of near 6 feet. The panicle is very large, of a brown chocolate colour, and bending to one side; long white hairs grow from the base of the inner pale of

* The same or a similar variety is now largely imported from Spain, for the manufacture of paper. The Romans used it in making ropes.—ED.

the floret, gradually elongate as the flowers advance to maturity, and finally, as they spread in every direction, give a beautiful silky-like appearance to the large waving panicle. Although this plant has no agricultural value as cattle forage, it is yet of considerable use for several other purposes.

The foregoing papers finish *the grasses* proper; and they include all the species of any value to the farmer, as well as many of those which are the most injurious to him as weeds, or otherwise worthless. We intend now *briefly* to notice a few other of the more commonly used herbage and forage plants, before proceeding to the more practical portion of these papers—viz., The Tables of Mixtures.

Natural order Leguminosæ.—The order *Leguminosæ* comprises all those genera which have the seeds contained in pods or *legumes*—hence the name; and ranks next in importance to the *gramineæ*, as furnishing plants suitable for hay or pasture.

CULTIVATED CLOVERS.

Trifolium pratense—Common or biennial red clover.—The biennial kinds of the broad-leaved clover are distinguished from the more permanent sorts, in their roots being thicker and fleshier, and penetrating deeper into the soil, and by their stems and foliage being less downy. Good native or English-grown seeds of *T. pratense* are large in size, and of a strong darkish purple colour. The plants raised from English red are of a most luxuriant habit of growth, yielding very heavy crops, and are particularly adapted for the better class of soils; they are subject, however, to continually altering sub-varieties, not only from diverse culture and variety of soil, but also through frequent intermixture of foreign seed. The Flemish or Dutch red clover plant is also of a strong but coarser habit, and succeeds better than the others on rather inferior soils, particularly if somewhat damp; its seeds, like those of the English variety, are large, but less plump, and inclining more to a whitish yellow colour. The French variety is of a rich green succulent appearance, with the stems and foliage more smooth, and the plants usually rather less in size than either of the preceding: from naturally belonging to a warm climate, it is best suited for sowing upon rich fertile soils in *sheltered* situations; its seeds are small and round, and have a larger portion of purple in their colour. The plants produced from American seed are also usually not so luxuriant in growth, having the stems thinner and more woody, and it is fully more permanent in duration; the seeds, like those of the French variety, are comparatively small in size, but inclining considerably more to a whitish yellow in colour; large quantities of year-old (and older) American

red seed are often in the market, which farmers should be careful to avoid.

Trifolium pratense perenne—Perennial red clover or cowgrass.—The *cultivated* variety of this clover differs but little from the common biennial sort in general habit and appearance; its herbage is more downy or hairy, the root fully more permanent, and it is of rather later growth. Its seeds are of large size, and plump, and when good are mostly of a very dark purple in colour; they are always higher priced than those of the common red. Cowgrass is of good service for a number of years' pasture, although it is now presumed that the Alsyke or hybrid sort has superior claims.

Trifolium medium—Zigzag clover or marl-grass.—This wild species, from bearing the name of Cowgrass in some districts, is often confounded with the preceding variety, and recommended accordingly for pasturage, on account of its permanency; but it can only be considered as a weed where naturally abundant, for cattle seldom eat it except when their pasture is very bare, and its strong *creeping roots* are also very hurtful to grass lands, soon starving out every grass plant in their vicinity; and even was it more deserving, the small quantity of seeds which it matures debars it from extensive cultivation. This species also resembles the common red, but differs in having more rigid zigzag stems, with narrower and darker foliage, and chiefly in its creeping roots.

Trifolium repens—White or Dutch clover.—This is a species very well known, and amongst the very best of perennial *pasture* plants. It grows freely and naturally on a great variety of soils and situations, having probably a wider range of soil-adaptability than any other of our fibrous-rooted agricultural plants. The stems are creeping, and root at the joints, the roots being fibrous and very small as compared with those of the red species. The white clover, through its prostrate and creeping habit of the stems, and the comparatively small bulk it yields when mown, is not so suitable for hay crops; but it is of much value for grazing purposes, for which it is every way most admirably adapted. By analysis this species is inferior to the red in nutritive elements, and, like the red species, there are several varieties of it, some of which doubtless are more or less productive and nutritive.

Trifolium hybridum—Alsyke or hybrid clover.—This very superior perennial clover, being the latest introduced, is generally considered a hybrid between the white and broad-leaved red sorts. It is said to be a native of Sweden, and was first brought into notice in this country in the year 1834. It is of very hardy habit, resisting the extremes of drought in summer and of the severest winter; and is also wonderfully productive, especially on moist soils, being of a more branching habit than the common red, and tillering out laterally over the ground. The roots of this species are fibrous and perennial, and the whole plant of a very succulent nature. It is valu-

able both for hay-crops and as pasturage, and specially to many farmers, from the certainty of producing a crop upon such lands as have become what is called *clover-sick*. The seeds of the alsyke are still comparatively high in price, although probably they will come still farther down, as the increasing demand will no doubt cause an increased supply; if it is, however, a *real hybrid*, we cannot expect ever to see its seeds rate as low as the *usual average* of red and white.

Medicago lupulina—Yellow clover or trefoil.—This plant, though popularly known as yellow clover and as trefoil, does not belong to the *Trifolium* genus, but is properly one of the Medick or Lucerne family—a distinguishing botanical character of which is, that the seed-pods are produced in more or less twisted *spirals*, one-celled and flattened. Many farmers are somewhat prejudiced against the yellow clover; yet it is equal at least to the white in nutritive value; its produce for mowing is much more abundant; and it comes away earlier in spring, besides making a more vigorous autumnal growth, though not so good in the height of summer when the white is at its best. On these grounds it is recommended that the yellow seeds should form a proportion in every mixture either for hay or pasture, more particularly as the extra expense is a mere trifle, the seeds of the yellow on an average not exceeding in price one-third that of those of white, besides being nearly always of better growing quality. It is by no means, however, intended that the farmer should diminish his quantities of the white seeds; two or more species of plants, either for hay or grazing, are always better than one only, and 1s. to 1s. 6d. per acre of increased expense would bear no comparison with the increased bulk of hay or productiveness of the pasture. The above recommendation is borne out, specially on their light soils, by the practice of very many experienced and most intelligent farmers, every way qualified to form a correct estimate.

The average price of good yellow clover-seeds to farmers may be put down at 4d. to 4½d. per lb. The prices of red and white vary more in different seasons; a near approach to their averages may be given as 8d. to 9d. per lb. for the red, and 10d. to 1s. per lb. for the white. The seeds of both the red and white clovers often suffer serious injury from the attacks of a small insect of the weevil tribe, which not only completely destroys the germinative powers of a great portion of the seeds, but also deteriorates much of the remainder by partial gnawing; the white, in particular, is much infested, and prices of its seeds are very fluctuating; be it remarked also, that in those seasons when white seeds rate highest, the general quality is always the worst. It is a great mistake and false economy on the part of cultivators, when buying clover seeds, to refuse taking the best quality on account of it being some 1d. per lb. or so higher in price; the difference in the outlay per acre is little, and it is not doing justice to the soil by sowing inferior seed. It may be stated

as a general rule, applied to all sorts of seeds, that the advantage of "cheapness" is oftener than otherwise a delusion of the "penny wise and pound foolish" order. The competition in lowness of price is also a chief cause for frauds and adulterations being sometimes practised with seed. A fuss is raised every now and then about *doctored* clover seeds. Some parcels of red occasionally contain a small proportion of fine white sand, or very small rib-grass seeds, whether put in intentionally or grown along with the red seed is immaterial; these can easily be detected and avoided. The *doctoring* alluded to is done with colouring matter, such as dyeing inferior white seed of a bluish colour to resemble and be sold for alsyke; coating inferior or dead old brownish white by the fumes of sulphur, so as to pass for new and fresh seed; or dyeing old or inferior-coloured red partially with indigo, so that it may sell at an enhanced price; these are some of the "chemical" operations *said to be* practised upon clover seeds. The writer does not believe that such practices obtain in the least degree in Scotland; and if any such *doctored* parcels ever do find their way into our country, they are in *very* infinitesimal proportion to the total amount. It requires a practised and skilful eye to detect these frauds, and the cultivator's best safeguard against such is to confine his purchases as much as possible to respectable seedsmen, many of whom have devoted the greater part of their lives to the study and investigation of seeds. In most small country towns seeds are sold by small shopkeepers, to a greater extent in Ireland and England than in Scotland. Suppose a London wholesale seedhouse, who may have been dabbling to some extent in "*doctoring* processes," either upon clover or other kinds of seeds, wish to find a market for their *unsound* wares, to whom will they naturally offer such? It is not very probable that the *regular* seedsman, who has a *thorough knowledge* of his trade, runs the slightest risk of even getting an offer. It is in fact through the competition and cutting down of prices by these two-month-in-the-year seed-sellers that adulterations and frauds in seeds are fostered. The real seedsman's interests are quite identical with those of the farmer.

COMMON BIRD'S-FOOT TREFOIL

(*Lotus corniculatus*, of the natural order *Leguminosæ*).

Legume, one-celled, with many seeds, round and straight. Naturally this plant is found growing abundantly on dry elevated pastures of heathy soil. Its roots are perennial, thick and fusiform, and penetrating to a considerable depth, which enables it to withstand and retain its verdure through a long continuance of hot dry weather. The herbage of this species is highly nutritious, and seemingly much relished by cattle; and it can be recommended either for pasture or hay on such soils as are mentioned above, and also on very light dry

lands, yielding *off such soils* a larger bulk of herbage than any of the cultivated clovers. It blooms from end of June till August, the flowers being of a bright yellow when growing, but changing colour when near ripe. Another species, the *Lotus major*—greater bird's-foot trefoil—has a more luxuriant habit, and is found naturally in moist situations, as under damp hedges. This species is creeping-rooted, and succeeds best on such soils as have a portion of peat in their composition. It may be considered the best of all the clover tribe for withstanding an excess of moisture, and might be profitably introduced into irrigated meadows. The seeds of it are now cheaper in price, and can be had from 1s. 6d. to 1s. 9d. per lb. The herbage of both the above contains a greater proportion of bitter extractive and saltish elements than that of the common cultivated clovers; the latter again containing more of these bitter principles than the grasses, and this is the chief reason why grass and clover hay, when mixed, is superior in wholesomeness to hay made from grass alone. The two species of *lotus* noticed are the only ones having agricultural interest.

CRIMSON OR ITALIAN CLOVER, OR TREFOIL

(*Trifolium incarnatum*, of the natural order *Leguminosæ*).

Stem strong, much branched, and about 18 inches in height; flower-heads, oblong and tapering, and of a crimson flesh-colour; every part of the plant downy; root annual.

This *annual clover* plant has been recommended for sowing *in autumn*, as yielding an abundant crop of early green food for cattle in the forepart of the season. It is grown with much success in the southern counties of England, but its cultivation in Scotland has hitherto been very limited, and most probably our climate is rather cold for its profitable growth; possibly on some of our warm dry shore-lands it might be found to succeed. Its seeds can now be had at from 4d. to 6d. per lb.

CULTIVATED SAINFOIN

(*Onobrychis sativa*, of the natural order *Leguminosæ*), formerly placed as *Hedysarum onobrychis*.

Stems upright, and grow from 2 to 3 feet in height; leaves of 10 to 15 leaflets, smooth, acute, and opposite; flowers in spikes, on long footstalks, and of a fleshy-pink colour; pods toothed at the margin and ribs, one-celled, and one-seeded. This is a perennial herbaceous plant, partial to dry chalky soils. It is considered by cultivators in the south of England as their most important leguminous forage plant, for growing on the thin dry chalky soils peculiar to that district. Sainfoin seeds will not germinate if more than one year old, so that intending growers should be cautious when purchasing.

MILFOIL OR YARROW

(*Achillea millefolium*, of the natural order *Asteraceæ*, or *Compositæ*).

Stems usually about a foot in height, branching, with the flowers arranged in flattish heads, called Corymbs, at the ends of the branches; colour of flowers, commonly white, sometimes tinged with pink; leaves, bipinnate and hairy; root, perennial and creeping. The common species of this corymbiferous genus, *A. millefolium* (Fr. *millefeuille*) or thousand-leaved, so called from the leaves being cut into a vast number of narrow acute parts, abounds on the dry banks of rivers, and is very frequent round the borders of light dry pasture fields. Its roots are powerfully creeping, and in rich fertile dry soils, the yarrow is apt to become a troublesome weed, if not kept down either by sheep grazing or being cut over. It can endure an extreme amount of drought without being injured, being often seen flourishing in the very poorest and most arid situations; and on this account, for one cause, it can be recommended as a small ingredient in a mixture for sowing down improved rabbit-warrens, and other suchlike light dry lands. The whole plant possesses aromatic and astringent properties, and is greedily fed down by sheep; which animals most probably eat it with such a relish more as a condiment, as otherwise it is rather deficient in nutritive matter. The yarrow, when in *due proportion*, is found a very grateful and valuable plant in sheep pastures. About 1 lb. of its seeds is sufficient to the acre, and they are sold at from 1s. 6d. to 1s. 9d. per lb.

COMMON OR PLAIN PARSLEY

(*Apium petroselinum*, of the natural order *Umbelliferæ*).

This plant is so well known through the curled sort of the garden, that it is unnecessary to describe it particularly. The leaves of parsley are eaten freely by most of our herbivorous domestic animals, especially by sheep. They are believed to act as a preventive of the *liver-rot* in sheep; and on this account, and also because of its claim as a condiment, the parsley is recommended te be sown as a minor ingredient in all mixtures of grass seeds intended for sheep pasture, particularly upon light and medium soils. The seeds of the plain-leaved sort are kept by most regular seedsmen for farm purposes, and rate about 1s., or under, per lb.; about 1 lb. per acre of seed may be considered a sufficient proportion.

RIB-GRASS OR LANCE-LEAVED PLANTAIN

(*Plantago lanceolata*, of the natural order *Plantagineæ*), known also as "Lamb's tongue" in some parts.

This plant is found most frequently growing upon dry soils, but has a pretty wide range of adaptation. Its root is perennial; stems

without leaves, growing to a height of from 9 to 15 inches, and crowned with a short oblong spike, producing many seeds; and the root-leaves are numerous, long and lanceolate shaped, spreading and lying flat on the ground. The rib-grass sends forth its herbage very early, at which time it may be sparsely eaten by cattle and sheep from want of better, and it was formerly recommended on this account, to be sown in small mixture with grass seeds; however, it seems now deservedly getting into little repute, through the close prostrate habit of its broad root-leaves, thus occupying a great surface of soil, to the exclusion of more profitable grasses and clovers, and also from live stock refusing to eat it as the season gradually progresses. In some parcels of rye-grass seed as saved, the seeds of the rib-grass are very plentifully intermixed, and the latter ought to be carefully sifted out ere using the rye-grass. Through some farmers in the west country sowing their own rye-grass without having had it properly cleaned, many grass fields may be seen with nearly one-half the surface of the soil occupied by rib-grass leaves (not to mention at all the preponderance of other *weeds* on the remaining half); in such instances as these, where the rib-grass seeds are so abundant, and not taken out, it is to no good in sowing the seeds of clover or of other fine grasses, as if even they do get germinating, their young seedlings are immediately afterwards smothered, and so killed by the broad prostrate leaves of the rib. Considerable quantities of rib-seeds are obtained by the seedsmen of Ayrshire from out the stocks of rye-grass, but these some years back there has been little or no wholesale demand for them, and this goes to show that the practice of introducing rib-grass seeds into grazing mixtures has now very much fallen off.

KINDS AND QUANTITIES OF GRASS AND CLOVER SEEDS FOR SOWING DOWN LAND, WITH REMARKS THEREON.

In sowing down land to pasture or for hay, farmers should bear in mind that, though all kinds of seeds will grow best as a general rule on the best land, still that, even on their naturally poorest soils, they may obtain very fair grazing or hay crops by having the soil thoroughly cleaned and liberally manured. It is an essential requisite to the obtaining of really nutritious and abundant pasturage, that all the roots of creeping, worthless grasses, and other weeds, shall have been previously taken out of the soil, to at least as great an extent as is possible; if such has not been properly done, and unless also his land be in a good state of fertility, the farmer may sow what quantity and what kinds of seeds he pleases per acre, but he will never obtain a really good pasture.

Much care has been bestowed upon the various Tables of Mixtures, and they are founded on a long course of experience in making up such. They include all those species best qualified and conjointly

requisite for the production of good hay crops, or plentiful and nourishing pasture. Every attention also has been paid to keep the mixtures as low in price as was consistent with their usefulness. However, these mixtures, or any mixtures, cannot be laid down as fixed rules whereby to act. Soils are so diverse in kind, situation, and condition, even upon the same farm, that no one mixture is competent to suit perfectly almost any two fields. They are merely, then, given as *guides* to farmers, in choosing their seeds. Farmers must judge for themselves as to the proper kinds and exact proportionable quantities of each of these to sow, from the particular character and state of the soil, its location and altitude, and the purposes for which the seeds are intended. Likewise too, when the land to be sown down has a natural tendency to produce any particular kind of grass, such must be taken into account when making up the mixture. Many experiments have been made with the view to ascertain at what depth of covering the seeds of the grasses and clovers will germinate, and thrive best afterwards. The results of these may be summed up by saying, that the seeds of the grasses generally germinate quickly enough, and most evenly, and the plants grow most vigorously afterwards, when covered to a depth not exceeding one-half of an inch. A very few of the larger-sized grass-seeds will germinate and come up even at from 1 to 1½ inch depth, but beyond that a braird of any of their seeds can scarcely be looked for. Of course, something must be placed to the nature and state of the soil on which they are sown. Seeds of all kinds will braird as quickly from a much greater depth in warm dry sands, as they will from a less in cold, stiff, wet clays. Clover-seeds, and those of some of the finer-seeded grasses, such as timothy, the meadow grasses, golden oat-grass, dogstail, and a few others, do best at from nothing to about the one-fourth of an inch, or if just barely covered.

In most cases, between 30 and 40 lb. of seed per imperial acre is enough to sufficiently clothe the surface of the soil with plants; but the exact quantities must depend upon the character of the soil, its state of pulverisation, and of its wetness or dryness, and something too upon the growing quality of the seeds sown. Heavy soils require more seeds than those of a light nature: and be it remarked that the latter, when very moist, through springs or otherwise, approach more towards that of the former; whilst well-drained, dry, clayey soils approach those of a lighter nature, with regard to the kinds of seeds and the quantities of these required for sowing. When the land has to lie under grass for a few years, more seed should be sown than if only for one year's hay. More anon on this subject of quantity. The quantities are stated in weight rather than in measure, the former being by much the more correct system of the two.

No. 1.

Mixture of seeds for one year's hay, or green cutting. Soil of a medium.

$\frac{A}{I}$	Lb. per Statute Acre.
Italian ryegrass seed, ...	18
Biennial red clover seed, . . .	8
Alsyke or hybrid do., . . .	4
Trefoil or yellow do., . . .	2
	Lb. 32

Or a cheaper mixture, as follows :—

$\frac{B}{I}$	Lb. per Statute Acre.
Common ryegrass seed, . . .	15
Italian do. do., . . .	9
Biennial red clover-seed, . . .	6
Alsyke or hybrid do., . . .	2
Trefoil or yellow do., . . .	4
	Lb. 36

Price : $\frac{A}{I}$ should cost about 17s. ; $\frac{B}{I}$ about 14s.

A mixture which would yield a *very large* bulk and weight of hay, of a nutritious, wholesome quality, might be composed of the following, for sowing upon *moist heavy loams*, or *wet clays* :—

$\frac{C}{I}$	Lb. per Statute Acre.
Tall fertile fescue-grass *(Festuca elatior)*, . . .	12
Rough-stalked meadow-grass *(Poa trivialis)*, .	6
Meadow catstail-grass *(Phleum pratense)*, . .	4
Biennial red clover *(Trifolium pratense)*, . .	6
Alsyke do., *(Trifolium hybridum)*, . .	2
Yellow do., *(Medicago lupulina)*, . .	2
	Lb. 32

This mixture however, in the present state of prices, would cost about 25s., or fully that, per acre ; and the quantity of seed allowed is even to the under side of that required for such heavy soils. It would be specially suitable for rich moist *heavy* lands in the vicinity of gentlemen's policy-grounds, where the fields are usually much sheltered by trees ; and the first cutting should be taken when the *Tall Fescue is coming into flower*. It could be made equally suitable for one or two years' pasturing after the hay crop by the addition of 3 to 4 lb. of white clover.

For the selection of the best quality to sow of the common ryegrass in $\frac{B}{I}$ mixture, see the paper upon that grass. It was hinted that more would be said on the subject of *quantity* of seed required per acre. The writer has a dim recollection of having seen it stated somewhere, that about two-thirds of the seeds sown by farmers of every kind are somehow or other destroyed—that is, only some one-third part of all the seeds sown ever arrive at completion, or attain the end for which nature intended them by producing and ripening a supply of each their own kind.

About 35 lb. of seeds, two-thirds grass and one-third clover, will give us nearly three seeds to each square inch of soil in the acre; and *if every one* of the seeds could be depended upon to perfect a plant, this would certainly be a superabundance if intended for hay crops, although questionable if any more than enough upon rich fertile soils for pasturage, some old natural pastures turning out many more roots to the square foot than the number indicated above. But the statement made at the commencement of this paragraph does not even go far enough with respect to grass-seeds, and particularly to clovers. Much less than a third part of that sown of them ever arrive at completion. Taking the average run of all the seed of red and white clovers sent out one year with another, little more than one-half of the seeds can germinate, or have that power within them, even as they come from the plants. There are always, too, more or less clover-seeds held over by merchants—some years very considerable quantities—and these one-year or more old clovers, specially the red sorts, though having still vitality enough to vegetate, very many of the young plants from such soon decay and die, and but few of them have strength to make a luxuriant growth. Besides, the land to be sown down is in many cases in such a rough cloddy state, that very many of the seeds are covered to too great a depth for germination; and also, many of the young embryo plants are eaten or destroyed by insects of one kind or other. Taking all things, then, into consideration—but the fact is, there is no use in speculating any longer on the subject—practically it is found less seed than that noted above will not do. The price of grass and clover seeds is such a small item amongst the farmer's other outlays, that it is better to err on the safe side by sowing plenty of seed than to run the risk of a less crop through not having a sufficiency.

No. 2.

Mixture of seeds for one year's hay, and one or two years' pasture following.

Medium soils.

	Lb. per Statute Acre.
Common ryegrass seed,	16 or 17
Italian do. do.,	9
Meadow catstail grass do.,	2
Biennial red clover do.,	3
Alsyke or hybrid do. do.,	2
White do. do.,	2½
Yellow do. do.,	3 or 2½
	Lb. 38

The above mixture of seeds should cost the farmer about 15s. If the character of the soil inclined to a lighter than a medium, the 2 lb. of timothy might as well be withdrawn, or at least diminished, and the clovers increased 1 lb. or so instead; if, on the contrary, the

soil approached to a clayey loam, the timothy may be increased to 3 or 4 lb. per acre, lessening the ryegrasses in proportion.

No. 3.

Mixture of seeds for one year's hay, and two at least or more years' pasture following. Soil of a medium, and in *good heart*.

$\frac{A}{3}$	Lb. per Statute Acre.
Common ryegrass (*Lolium perenne*),	10 to 12
Italian do. (*Lolium italicum*),	9
Cocksfoot grass (*Dactylis glomerata*),	3
Meadow fescue-grass (*Festuca pratense*),	3
Rough-stalked meadow-grass (*Poa trivialis*),	2
Meadow catstail-grass (*Phleum pratense*),	2
Biennial red clover (*Trifolium pratense*),	2
Alsyke do. (*Trifolium hybridum*),	1
White do. (*Trifolium repens*),	3
Yellow do. (*Medicago lupulina*),	3
	Lb. 38 or 40

Or, if for two, three, or more years' grazing alone, and no hay; say—

$\frac{B}{3}$.	Lb. per Statute Acre.
Common ryegrass,	12 to 14
Italian do.,	5
Cocksfoot grass,	4
Meadow fescue-grass,	4
(Or better, perhaps, 3 lb. m. fescue and 1 lb. dogstail).	
Rough-stalked meadow-grass,	2
Meadow catstail-grass,	2
Perennial red clover or cow-grass,	1
Alsyke clover,	1
White do.,	4
Yellow do.,	3
	Lb. 38 or 40

If intended to be grazed partly or occasionally by sheep, add 1 lb of field-parsley per acre.

The above two mixtures should cost, $\frac{A}{3}$ about 17s. 6d., and $\frac{B}{3}$ about 18s. 6d. The remark anent the timothy, appended to No. 2 Table, is of course equally applicable here. The quantity of rough-stalked meadow-grass given in No. 3, may be very advantageously increased if the soil is a rather damp rich deep loam, lessening, if need be, the common ryegrass to an equal extent. In some seasons, when the white clover seeds are *very high in price*, and then usually of worse average quality, it will help to keep the cost more within bounds, and be about equally as profitable in the grass crop, to lessen the quantity of white seeds, and make up for that by an increase in the yellow, and, to a slight extent, the hybrid sorts.

The prices of the seeds of most of the "natural" grasses are still high as compared with that of ryegrass; but if a demand to any extent was springing up, a more abundant supply would doubtless soon be brought forward, and the prices of many of them (such as those in No. 3 Table) in consequence quickly recede. The seeds of some which are now sent out are often *very inferior* in growing quality through being fusty and old—having lain too long in the seedsmen's stores. This, of course, is caused by the want of demand. The seedsman, or seed-grower, should endeavour as much as possible never to rear or lay in a greater supply of seeds than he has a reasonable expectation of getting rid of whilst they are fresh. That supply, however, cannot be hit upon to a nicety; and it is not to be expected that the seedsman must "fling overboard" all the seeds which have to be held over: if such was to be done, the cultivator may make up his mind to pay a much higher price for seeds than he has been in the habit of doing. Some speculators there may be who do, in cheap seasons, buy up large stocks of certain seeds for the purpose of holding over, and, if possible, realising a greater profit; but such speculation ought not to be encouraged, as it is very adverse to the interests of agriculture. It is the seedsman's duty, however, to inform his farmer-customers, so far as he himself knows, as to what seeds are really good, and of any others which may be deficient. This is necessary, not only in regard to old seeds, but also, because in some seasons the seeds of many plants are more defective in growing quality than they are in others—naturally they are so; and consequently a greater weight of seed has to be sown to the acre when of such inferior quality. To enable seedsmen to do this, those of them who attend properly to their business generally test the growing-quality of all the seeds they send out. However, if farmers cannot depend thoroughly on the merchant from whom they get their supplies of seeds (though we believe the more confidence there is in business transactions betwixt farmer and seedsman the better for the interests of both parties), they ought, before purchasing, to procure small samples, and test them, by sowing a fixed number in a seed-pan, observing what proportion of the number sown germinate, and the *time* which these take to do so. Confining the following remark to grasses and clovers, there is not so much difference betwixt the respective merits of those most commonly used, but that one kind may be sometimes substituted for another which happens that season to be deficient in quality, observing that the substitute is as near as possible suitable for the particular soil and purpose. Allowing that the cultivator has satisfied himself as to the growing quality of the seeds, an every way superior pasture, and also hay-crop, might be had off such soils as that mentioned in No. 3 Table, by sowing the following proportions of grass-seeds:—

$\frac{C}{3}$

	Lb.
Cocksfoot-grass,	8
Meadow fescue-grass,	6
Rough-stalked meadow-grass,	4
Common ryegrass and Italian do.,	8
Fibrous-rooted tall oat-grass,	2
Meadow catstail-grass,	2
Clovers—in same proportion as in other mixtures of No. 3,	9
	Lb. 39

If sheep were occasionally to be grazed on this mixture, it would be advisable to add 1 lb. each of dogstail, hard fescue, and parsley—subtracting an equal quantity from the cocksfoot and ryegrasses. The herbage of such a mixture as $\frac{C}{3}$ would be much more productive and nourishing, and also greatly earlier. It would cost, at present prices, fully 23s.; but, if for a hay-crop alone, a less weight of seed would be sufficient.

Many farmers labour under the impression that the "natural" grasses, such as those given above, and others, are inadmissible, or at least inferior to the cultivated or "artificial" ryegrass for alternate-cropping mixtures; but if cultivators would make sure to procure *fresh* and *good-growing seeds* of the best species of these, either by raising such themselves, or "seeing that they get them" so, they would find these species equally suitable—on many soils more suitable and much more productive—for sowing in any course of rotation whatever. All those species having *fibrous* roots, if equal in other respects, are every whit as well adapted as the ryegrass for the alternate system of husbandry; and if superior in other respects, so much more are they better adapted. In fact, the very artificial nature of the ryegrass has weakened its roots so much that it dies out of its own accord from pastures only too quickly.

It is, in a manner, superfluous giving a mixture for a ryegrass hay-crop *off which the seeds are to be preserved*, as the more ryegrass and the less of any other plant, so much the more remunerating will the crop of seed be. However, if our Scotch west-country farmers, and others, will persist in supplying a great part of the three kingdoms with ryegrass seeds, let them sow a pretty large proportion of white clover—say 8 lb. per acre at least—along with the ryegrass, and a tithe of the damage inflicted may be avoided, specially with regard to the pasture following. Not more than a pound or two of either the red, alsyke, or yellow, is allowable in a mixture for such purpose.

No. 4.

Mixture of Seeds for Permanent Pasture.

English Names.	Botanical Names.	Lb. per Statute Acre.		
		Light Soils.	Medium Soils.	Heavy Soils.
Common ryegrass, . .	Lolium perenne, . .	8	9	10
Italian do., . .	Lolium italicum, . .	4	4	4
Cocksfoot-grass, . .	Dactylis glomerata, . .	2	4	3
Meadow fescue-grass, .	Bucetum (festuca) pratense,	2	4	4
Tall do., . .	Bucetum (festuca) elatius,	...	1	1½
Common hard do., . .	Festuca duriuscula, . .	2	2	1
Purple do. do., . .	Festuca dur. rubra, . .	2½	...	...
Meadow foxtail-grass, .	Alopecurus pratensis, .	1	1½	2½
Rough-stalked meadow-grass,	Poa trivialis, . . .	...	2	2½
Smooth-stalked do., .	Poa pratensis, . . .	2	...	...
Wood-growing do., .	Poa nemoralis, . .	½	1	1½
Meadow catstail-grass, .	Phleum pratense, . .	½	1	2½
Crested dogstail-grass, .	Cynosurus cristatus, .	1	½	½
Golden oat-grass, . .	Trisetum (avena) flavescens,	1	½	...
Sweet vernal-grass, . .	Anthoxanthum odoratum,	...	½	1
White clover, ...	Trifolium repens, . .	3	4	4
Yellow do., ...	Medicago lupulina, . .	4	3	3
Perl. red do., ...	Trifolium pratense perenne,	1	1	1
Alsyke do., ...	Trifolium hybridum, .	1	1	2
Common birdsfoot trefoil,	Lotus corniculatus, . .	½	...	...
		36	40	44

If intended to be depastured partly by sheep, the addition of 1 lb. of parsley and ½ lb. of yarrow to the acre would be found beneficial.

Prices: Light soils, about 21s. 6d.; medium soils, about 24s. 6d.; and heavy soils, about 28s., each per acre.

The previous remarks about the *growing quality* and prices of natural grass-seeds are of course equally applicable under this and all the succeeding tables. The necessity for having all *creeping roots* thoroughly cleaned out of the soil previous to sowing down *permanently*, is more stringent even than if only for a few years' pasture; in the former case, the baneful consequences, if such work has only been slurred over, cannot be again remedied. Great care should be bestowed upon the sowing of such mixtures as those of No. 4. If intended to be sown all at once, the land should be rolled previous to sowing, and just slightly scratched afterwards with very short-tined harrows; thus giving an evenlier bed for the finer seeds, and a more uniform depth of covering for all. By those cultivators who would not grudge the expense, another pound or two of other species might be both usefully and profitably introduced. In sowing down land permanently, if the land is in anything like the state of fertility it ought to be, you cannot almost sow too much seed when a great variety of kinds are used; every portion of the surface is thus at once densely covered, to the nearly total suppression of annual

and other weeds, and the herbage ranking from the first about equal to the richest old pasture. It is hardly needful, one would think, to impress upon intelligent farmers the great necessity of sowing only perfectly clean seeds—that is, free of weed seeds, or of other kinds not suitable for the particular purpose. The writer has seen parcels of natural grass seeds sent out in such a foul state as was disgraceful both to the seedsman who sold them and to the farmer who sowed them. It is a well-known fact to such persons as have made much practical observation on the growth of the grasses, that any fixed portion of land will maintain and keep up to their maximum vigour of growth about double the quantity of grass and herbage plants when sown down with a considerable variety of sorts, as in No. 4 mixtures, than what it will do if sown down with an equal weight of one or two species only. This is owing to the strongly social habits of most of the grasses, as noticed in the introduction to these papers. Even if a much larger quantity of seed of the two species only be sown, although more plants will vegetate and come away at first, the extra plants very soon decay and die out, and some years have to elapse ere the blank spaces are again completely filled up, by the sprouting of other species of grass, or more commonly of weeds, either from seeds lying dormant in the soil, carried thither by the wind, voided along with the excrements of birds, or otherwise. There is not much use, however, in sowing so great a number of species upon poor thin land, very wet clays, or soils of a single simple character, and not very fertile; for pasture on such, four or five of the species of grasses specially adapted (along with clovers) may be sown with sufficiency. In many fields upon upland farms there are low-lying parts or corners of them often of a wet peaty nature or incumbent upon moss; when sowing down such fields permanently, an extra quantity of timothy, and specially of fiorin seeds, should be flung upon these places. The rapidity with which the fiorin propagates itself would soon cover them over with its herbage, and prevent, to some extent, rushes and other innutritious plants from arising.

In some of the dairy districts in the west of Scotland, where the soil is of a very stiff clayish nature, it is still a somewhat common practice to allow the land to rest under grass for a considerable number of years, then breaking up with two crops of oats, and again laying down to grass; these soils being considered of too heavy a nature to work profitably under green-cropping, especially with so much and continuous rainfall as in Ayrshire. Such lands are generally sown down with nothing else save ryegrass and clover, and the effect produced in pastures by sowing only two species or so of plants, will be seen in the preceding remarks. As the mixture for *heavy soils*, given in No. 4 Table, may be thought rather expensive by some farmers, the following cheaper mixture is given for the lands under the practice alluded to, so as to suit the extent of the opening of their purses:—

$\frac{H}{4}$

	Lb.
Perennial ryegrass,	16
Meadow-catstail or timothy-grass,	8
Meadow fescue-grass,	3
Rough-stalked meadow-grass,	2
Meadow foxtail-grass,	2
Hard fescue and crested dogstail, ½ lb. of each,	1
White clover,	4
Hybrid clover,	2
Yellow clover,	2
	Lb. 40

This mixture of 40 lb. of seed should cost only about 20s.; and though the total quantity is less by 4 lb. than that of No. 4 proper, there would be about an equal number of individual seeds through the increased proportion of the timothy. Of course, by sowing such a mixture as $\frac{H}{4}$, the farmer would miss his ryegrass-seed crop; but for those west-country farmers, who will have a grass-seed crop in the rotation, why not let them only sow timothy-grass nearly on such heavy soils, and seed it? The hay of timothy is much richer when the grass is cut down in a ripe state than if taken when in flower; a crop of its seeds, the writer thinks, should pay equally as well as that of the other; and the pasture following would be much superior to that from the so-called fine Ayrshire perennial, but in reality short-lived ryegrass. If doing so, it would be advisable to sow along with the timothy, for the advantage of having early grass for the cows, say, 4 to 5 lb. in all, of meadow foxtail and meadow fescue; these would not interfere with the seeding of the timothy, or if even any of their seeds were saved, they could easily be separated by sifting.

No. 5.

Mixture of seeds for permanent sheep pasture, on dry elevated lands of good soil; *in contradistinction to those elevated heathy, or moorish soils, for which a* cheaper compound is given in No. 10 $\frac{A}{10}$ Table.

	Lb. per Statute Acre.
Common ryegrass,	10 or 12
Sheep's fescue-grass (*F. ovina*, and *var.*)	6
Hardish fescue-grass	4
Crested dogstail-grass,	3
Cocksfoot-grass,	2
Smooth-stalked meadow-grass (*Poa pratensis*),	2
Golden oatgrass,	1½
Sweet vernal-grass,	0½
White clover,	3
Yellow clover,	2
Alsyke clover,	1
Common birdsfoot trefoil,	0½
Field parsley,	1
Milfoil or yarrow,	0½
	Lb. 37 to 39

The above mixture would make splendid grazing for sheep, both fattening and wholesome, and should cost about 24s.

Both the common whin or furze, and the common yellow broom, have been recommended for sowing in sheep pastures, as winter food during heavy falls of snow, but they are of very exceptionable use; the latter is supposed to be eaten more by way of medicine than for actual nourishment, and it produces bad effects if partaken of too largely.

No. 6.

Mixture of seeds for permanent pasture in pleasure-grounds and ornamental parks, interspersed with trees. Soil of a medium.

	Lb. per Statute Acre.
Common ryegrass,	6 or 8
Italian ryegrass,	4
Wood meadow-grass (*Poa nemoralis*),	5
Hard fescue-grass,	4
Meadow foxtail-grass,	2
Meadow fescue-grass,	2
Rough-stalked meadow-grass,	2
Sweet vernal-grass,	2
Golden oatgrass,	1
Crested dogstail-grass,	1
Meadow catstail-grass,	1
Field parsley,	1
White clover,	6
Yellow clover,	2
Alsyke clover,	1
	Lb. 40 to 42

On any portions of the grounds which may incline to a lighter and drier nature, the rough-stalked meadow-grass, along with the foxtail and timothy grasses, may be diminished more or less, and the amount made up by adding proportional quantities of creeping hardish fescue, or fine-leaved fescue (*F. tenuifolia*), common birds-foot trefoil and yarrow. No. 6 mixture would cost well on to 30s.; but the herbage produced would be both fine and pleasing, wholesome and nutritious; and it is made up on the understanding that the grounds, as is usually the case, are to be chiefly depastured by sheep and deer.

These grounds and parks are often sown down with seeds by themselves without a cereal crop, in which case the benefit in pasture is much sooner acquired, through the soil not having been in any degree exhausted; there ought, however, always to be sown along with them, if sown at the usual time in spring, say a bushel or so of barley; and if sown in autumn the same quantity of rye, as protection to the young plants from scorching drought and winter frosts; observing that the barley or rye, after having served their purpose, shall be cut down whilst in a green state. The same rule applies to all the mixtures when any of them are to be *sown without a crop;* and in such cases a slightly increased quantity of seed is necessary.

No. 7.

Mixture of grass seeds for sowing down meadow land permanently, to be kept under a regular system of irrigation, and annually mown for hay. Soil of a good strong loamy nature.

	Lb. per Statute Acre.
Common ryegrass,	8
Italian do.,	8
Meadow foxtail-grass,	8
Meadow fescue-grass,	4
Tall fertile do.,	2
Ryegrass-like or spiked do. (*Festuca loliacea*),	2
Rough-stalked meadow-grass,	4
Meadow catstail-grass,	3
Fiorin-grass (*Agrostis stolonifera*),	2
Flote sweet meadow-grass (*Poa fluitans*),	2
Crested dogstail-grass and sweet vernal grass, ½ lb of each,	1
	Lb. 44

Fully a bushel of barley or rye if sown without a crop. Cost of above mixture, at present prices, near 28s.

The more the soil inclined to a clayish nature, the tall fescue and timothy grasses should be increased by 1 lb. each, and 1 lb., or fully, of reed canary-grass might also be beneficially put in, deducting equal quantity off the ryegrasses. It may be thought that the ryegrasses are in too great proportion for *meadow* purposes, but it must be considered that the foxtail-grass takes nearly four or five years to arrive at its full powers, and both it and the fescues gradually for some time increase in productiveness, whilst the ryegrasses about four years old or so will have died out; a greater weight also has to be sown from there being no clover seeds in the mixture. The *Lotus major*, greater birdsfoot trefoil, might be somewhat recommended for irrigated meadows; 1 or 2 lb. of its seeds added would raise the cost a few shillings, and which at 28s. is even higher than most people like to give; but the increased product, particularly of the second cut, would amply repay.

On meadow land under irrigation, sown down with a mixture of seeds, such as that given in No. 7, a first cut of grass should be taken when most of the foxtail is in full flower; both the foxtail and fescue grasses in the mixture containing most nourishment when green, and the foxtail also reproducing very rapidly; besides, by taking the first cut early, the productive powers of the timothy, *Poa fluitans*, and other later grasses, are but little exhausted, and they come away more vigorously for the second mowing.

No. 8.

Mixture of seeds for sowing down lawns, terraces, domestic, drying, or bleaching greens, bowling-greens, &c.

	Lb. per Statute Acre.
Lolium perenne, of a light quality per bushel,	12
Cynosurus cristatus,	10
Festuca duriuscula (including a proportion of *F. tenuifolia*),	8
Poa nemoralis,	6
Poa pratensis,	2
Trisetum flavescens,	2
Trifolium repens,	4
	[illegible]

At the rate of fully a bushel of barley or rye per acre, to be sown along with for shelter.

The above seeds can be had, *mixed* in due proportion, at about 10d. per lb., cheaper if so much is required as would sow an acre.

No. 9.

Mixture of seeds for permanent pasture on improved moss, or peaty soils.

A/9

	Lb. per Statute Acre.
Common ryegrass,	6 or 7
Italian do.,	4
Meadow-catstail or timothy-grass,	9
Hardish fescue-grass,	4
Rough-stalked meadow-grass,	2
Fiorin or spreading bent-grass,	2
Meadow-fescue and meadow-foxtail grasses, 1 lb. of each,	2
White clover,	4
Yellow do.,	3
Greater birdsfoot trefoil (*Lotus major*),	1
	Lb. 38

For sowing down improved moss as a meadow for annual mowing, possibly the following mixture may be found as good as any that could be recommended:—

B/9

Meadow-catstail or timothy-grass,	14
Italian and common ryegrass, 4 lbs. each,	8
Rough-stalked meadow-grass,	4
Hardish fescue-grass,	2
Fiorin or spreading bent-grass,	2
Alsyke clover,	2
Yellow do.,	2
Greater birdsfoot trefoil,	1
	Lb. 35

These two mixtures should cost from 19s. to 20s. each.

The presence of the fiorin-grass in B/9 would have little effect in bulking the hay crop, but it is desirable as affording pasturage during the autumnal months and early part of winter. The hard fescue, too, in same mixture, although not adding greatly to the bulk, thickens the bottom of the grass for cutting, and maintains much of its verdure during the winter months.

It would be the more preferable method, and as profitable in the long-run, to sow the seeds of No. 9 mixtures without a cereal crop, casting in only before them say from 1 to 2 bushels of oats, for the purpose previously recommended. In the event of no regular cereal crop being grown, the ryegrass seed had better be increased by 4 to 5 lb., which does not cost much, and tends to prevent weed seeds from vegetating.

It would be preferable also, if convenient, in depasturing these peaty meadows during the autumn months and winter, that that should be done by sheep; as when large cattle are turned on to them, particularly if during wet weather, they tread the surface full of deep holes, which soon become filled with stagnant water to the destruction of the plants surrounding.

It is only a too common practice, after much expense has been incurred in bringing these damp mossy lands under cultivation, to sow them down in great part with woolly soft-grass seeds (*Holcus lanatus*). If the cultivator's only object was to cover the black nakedness of the land, he would certainly, by sowing such, secure the end intended; but if really good fattening pasture, or nourishing hay, were desired, a greater mistake could hardly be committed. A few pounds of woolly soft-grass seeds may be admissible in $\frac{B}{9}$ mixture for hay-crops, when bulk is of greater importance than quality; and also, if after the first year's pasture from $\frac{A}{9}$, any blank spaces occur throughout the field, a few of its seeds may be thrown upon these blanks; in the latter case, however, only in very limited quantity, as the woolly soft-grass sends up a profusion of flowering culms which are seldom eaten by either cows, sheep, or horses, and, these culms ripening and scattering the seeds, the grass is soon spread over the whole field, of which it will in a few years take nearly entire possession, being perfectly at home, and growing with the greatest facility and most luxuriantly upon such black soils.

No. 10.

Mixture of seeds for elevated heathy or moorish soils, which have been limed and improved by being brought through a course of tillage including green-crop, and then to be sown down to permanent grass principally as sheep pasture.

$\frac{A}{10}$	Lb. per Statute Acre.
Common ryegrass,	14
Sheep's fescue and hard fescue grasses, 4 lb. of each,	8
Meadow-catstail or timothy-grass,	3
Smooth-stalked meadow-grass and crested dogstail-grass, 1½ lb. of each,	3
Fiorin-grass and red-top or herd-grass, 1 lb. of each,	2
Wavy mountain hair-grass (*Aira flexuosa*),	1
Yellow clover,	4
White clover,	2
Common birdsfoot trefoil,	0½
Field parsley,	0½
	Lb. 38

The above mixture of seeds could be had for about 18s.

For such heathy lands of more inferior quality, which have been only pared and burned, or otherwise simply improved, with a view to the production of better pasturage, an even cheaper mixture of seeds to sow over them is desirable. ($\frac{B}{10}$.) For this purpose, about 2 bushels of cheap ryegrass seed, having a proportion of woolly soft-grass seeds intermixed, along with 5 lb., or so, of yellow and white clover seeds, may be used; and on any places of a damp nature which may occur over the lands, a few seeds of the timothy and fiorin grasses may be flung, whilst on the drier portions of the moor from 2 to 3 lb. per acre of hard and sheep's fescue, and of the crested dogstail grasses, may be introduced. The seeds for sowing as above would cost only from 9s. to 10s. per acre.

Upon farms situated close on the moor-edge there are frequently many of the fields which at one time formed part of the moor, but had been brought in and for long wrought under the alternate-cropping system; for hay crops on such fields, where usually *bulk* for winter keep is the farmer's primary want, the following mixture may be sown, say—

C/10

	Lb.
Common ryegrass-seed, of a heavy quality, . .	12
Field brome-grass do., (popularly "goosegrass") . .	12
Timothy-grass do., ...	4
Common red clover seed, ...	4
Yellow clover do., ...	4
	Lb. 36

This mixture would cost about 11s. 6d.

If the land was intended to rest under grass for two or three years after the hay crop, sow 3 lb. more of the ryegrass seed, and get it of a lighter quality, and add 4 lb. white clover seed to the mixture, lessening the red and yellow sorts by 1 lb. each.

No. 11.

Mixture of seeds for permanent pasture on improved warrens, light sandy links, or seaside bent-grounds, or other suchlike very light arid arenaceous soils.

A/11

	Lb. per Statute Acre.
Common ryegrass, ...	10 or 11
Purple creeping hard fescue (*Festuca rubra*), . .	6
Creeping meadow-grass (*Poa pratensis*), . . .	3
Crested dogstail-grass, ...	3
Common or fine bent-grass (*Agrostis vulgaris*), . .	2
Common Burnet (*Poterium sanguisorba*), . . .	2
Cultivated sainfoin (*Onobrychis sativa*), . . .	2
Milfoil or yarrow, ...	1
Yellow clover, ...	6
White clover, ...	2
	Lb. 37 to 38

This mixture should cost about 20s. to 21s.

A mixture for hay crops, or for one or two years' grazing upon such soils as above when wrought under an alternate system of cropping.

B/11

	Lb. per Statute Acre. Hay crops alone.	Hay crops and pasture.
Purple creeping hard fescue, ...	12	10
Common ryegrass, ...	5	7
Creeping or smooth-stalked meadow-grass, . .	3	3
Cultivated sainfoin, ...	4	3
Crested dogstail, ...	2	3
Yarrow or milfoil, ...	0	1
Yellow clover, ...	6	4
Hybrid clover, ...	3	2
White clover, ...	0	3
	Lb. 35	Lb. 36

The first of these two mixtures would cost about 20s., the second about 22s. The *Lotus corniculatus* usually rates fully as high as 1s. 6d. per lb., but a small proportion of its seeds in these last three mixtures would be found both useful and remunerative. Half a pound of parsley seed might also be beneficially thrown in.

It was remarked that one species of grass-seed might be sometimes substituted for another, when that other species happened to be defective in growing quality, or at least could not be found of good quality by the farmer or his particular seedsman. A few examples are here given; and in changing the kinds, their prices as well as suitableness should be kept in view. In No. 3 Table, for instance, if the rough-stalked meadow-grass could not be conveniently had of fresh good quality, by all means keep it out, and increase by an equal amount the cocksfoot and meadow fescue; or, suppose that, in No. 4 Table, the tall fescue and smooth-stalked meadow-grass are found figuring in the "black list," then omit or decrease them according to the state of their soundness, and make up the amount by adding to the meadow-catstail for the former, and to the hard fescues and dogstail for the latter. It would be easy to multiply examples, but these may be sufficient to show what the writer means. However, let it be distinctly understood that, when all the seeds can be got in anything like a fresh good-growing state, and as free as possible of weed seeds (for *cleaning* should also be carefully looked to), it is most desirable that the full number of different species should be sown—the greater in number of variety so much the better for both bulk and quality of hay and pasture.

A much more extensive demand for the seeds of the principal species of grasses might be reasonably expected if these seeds in general were more constantly sent out of something near as good growing quality as those of the ryegrass.

It is presumed that the foregoing descriptions, remarks, and tables of mixtures, may help to clear up somewhat any difficulty experienced by the farmer in selecting and using the proper kinds and quantities for the special character of soil and locality and purpose intended; and with the view of effecting some improvement in the quality of the seeds, and that the farmer may have them at as low a figure as possible, before concluding these papers, a few mixtures are here given of some of the more commonly used sorts, compounded in such a way as to be specially adapted for *seeding in combination.*

MIXTURES FOR SEEDING.

No. 1. On an average loamy soil: say 12 lb. cocksfoot, 10 lb. meadow-fescue, 6 lb. rough-stalked meadow-grass, 6 lb. perennial ryegrass, 4 lb. fibrous tall oat-grass, and 4 lb. white clover. One-third of the crop to be mown and bunched about the middle of July, earlier or later according to the season; another

third about the 22d, and the remainder near the end of the month, or even the beginning of August.

No. 2. On same kind of soil, and none the worse though rather moist: say meadow-fescue, 16 lb.; rough-stalked meadow-grass, 12 lb.; common hard fescue, 8 lb., and white clover, 4 lb. To be mown and bunched same as above, but beginning and finishing rather earlier.

No. 3. On a loamy soil of a lighter and drier nature; say crested dogstail, 24 lb.; meadow-fescue, 12 lb.; and white clover, 4 lb. This crop would be ready for cutting towards the end of the first week in August, and the two seeds could easily be separated with a common ryegrass sieve. The dogstail and timothy ripen their seeds about nearly the same time, and they could be saved in combination upon rather heavy loams, but it would be scarcely possible to again separate the two seeds.

No. 4. On rather heavy clay soils: say tall fertile fescue, 22 lb.; meadow-catstail or timothy, 14 lb.; and white clover, 4 lb. No. 4 mixture would be ripe for the scythe about the second week in August, and the two seeds can be separated same as in No. 3.

No. 5. On improved moss, or any soil of a peaty composition, the timothy can be grown very successfully by itself for seeding, only putting in a few lbs. of foxtail and fiorin, for the benefit of grazing in the early and late parts of the season: say timothy, 22 lb.; meadow-foxtail, 4 lb.; fiorin-grass, 4 lb.; white clover and greater birdsfoot trefoil, 2 lb. of each. The other two grasses would not interfere in the slightest with the seeding of the timothy; and this mixture would do very well also for permanent pasture upon such soils, costing about 22s. 6d.

No. 6. On a rather moist strong loam the meadow-foxtail could be sown by itself for seeding. The roots of this grass are of a most enduring nature, and even by itself, on suitable soils, it continues to increase in productiveness for a long period of time. Of course, also, such grasses as cocksfoot, meadow-fescue, rough-stalked meadow-grass, &c., can be grown profitably enough as hay crops by themselves, and their seeds saved separately.

And so on *ad libitum*, with mixtures in different proportions, suitable to different soils. The writer's idea of how farmers might manage to preserve the seeds of the above grasses and others is something of the following kind. There are few farms on which odd or out-of-the-way fields could not be got for sowing the above or other mixtures upon. He would, then, sow down these fields permanently, and seed them in halves—the one-half each alternate year; and that half not to be seeded, should, during that season, be mown whilst the grass was in a very green state, so as to destroy any annual weeds ere maturing their seeds. To seed the whole every year would be much too exhausting upon the roots; but by seeding each half alternately, and applying judicious top-dressings

of manure, such fields might be seeded profitably, and the seeds continuing nearly pure for a considerable number of years. Of course, it would be a *sine quâ non* to have the field most thoroughly cleaned and liberally manured before sowing down without a crop; and it would require to be also sharply looked to that the seeds for sowing down were thoroughly fresh, *clean*, and genuine. An abundance of seed should also be sown, so as, if possible, to prevent weeds of any kind from arising during the first season.

It is to be hoped that these papers will be found of some service in leading farmers to a better knowledge of the grasses, and therefrom to a better selection of seeds when sowing down their lands. If they even, however, tend to incline cultivators to the study of what may be called grass-botany, and to observation and practical experiment on growth and habits, likings and dislikings, &c., of the grasses, they (cultivators) will soon themselves become convinced of the great superiority of many species as compared with the artificial ryegrass, and be desirous of introducing the seeds of those more profitable species into their mixtures.

With regard to grass lands there is still, without doubt, great room for improvement, both as to the productiveness of herbage and the quality thereof.

In the writer's native district of the west, there has been very marked improvement these few years back as to quality in the manufacture of cheese; and he is convinced that, if equal attention was given to what may be styled the cultivation of cheese, in so far as the cow's usual feeding is concerned—viz., the growing of good grass—equal progress would soon be visible in the increased weight of the cheese, along with the improvement in quality.

ON VARIETIES OF LARCH.

By John Grigor, Forres Nurseries.

[Premium—Medium Gold Medal.]

Having had some experience in the growth of various species of this tree, I beg to offer a few remarks on the kinds with which I am acquainted. Although all the plants of this genus that have come under my observation are quite hardy, and endure any degree of frost during winter, or when they are in a dormant state, yet few plants are more sensitive, or suffer more when overtaken by frost during the season of their growth. Although alarm has sprung up from time to time, within my recollection, and a fear that a few years would extirpate the common species throughout the country, yet in many districts it continues to flourish, and to produce a crop of timber more profitable than that of any other tree, native or foreign.

So far as my experience goes, the soil and situation best adapted for one species seem equally adapted for the whole, and the casualties to which one kind is subjected pervade every species to a greater or less extent.

Larix Europæa.—The two most common varieties of this species are the *L. E. rubra*, or red larch of the Alps of France and Switzerland, and the *L. E. alba*, which is a native of the Tyrol and other mountains in Germany. In this country there is also an intermediate variety between the two last-mentioned sorts, producing female blossoms of a pink colour; this and the first-mentioned variety may be classed together, being equally valuable and hardy. I have lately seen it recorded in one of the principal works on forest management, that "the red larch does not attain to more than one third of the cubic contents which the white larch does," and that "this is observable in every plantation where the two varieties are found growing together." This represents a very important difference between the two trees, and if correct, would soon lead to the suppression of the red variety as a timber tree; it will be found, however, that this statement is not correct.

In all the districts where I am acquainted, the red is the variety most approved of, and I think it forms nine-tenths of the best larch trees in Scotland. It is decidedly the hardiest of the two, and all the celebrated trees of the larch throughout Scotland, such as those at Dunkeld, Monymusk, &c., are of the red variety.

L. E. alba.—This is the prevailing variety of the species in the mountains of Germany. Large quantities of seeds have during the last twenty years been imported by the London and Glasgow tree seedsmen, and sold throughout the country; and very conflicting

opinions are entertained regarding the merits of the tree. Grown in transplanted lines alongside of the red variety, the bark and foliage of this plant have a clearer or whiter appearance, and thus situated, the difference is very apparent; but grown in a mixed state, it is somewhat difficult to distinguish every plant of its kind. When young, the white is decidedly the fastest grower, but it often fails to ripen its young shoots in autumn, and in spring it is frequently seen with the points of the shoots hanging down retaining the immature foliage of the former year; and although the growth of the young plant is more rapid, yet the loss of its top, and the branchiness which ensues, retard its progress, and render it less desirable in the climate of Scotland than the red variety.

It is in the opening-up of the season, commonly in the month of May, after the plant has been excited to growth, that the greatest casualties overtake the different varieties of larch. The slightest touch of frost has then a ruinous effect, and such an occurrence is uniformly followed by an attack of the *coccus laricis*, the well-known species of aphis. These insects multiply with enormous rapidity, and in many plantations under such circumstances at this season, consume every leaf as it emerges from the bud, and several weeks elapse sometimes before the tree regains its foliage; this state of affairs points to the necessity of situating the larch in a northern aspect, or cool situation, where it may not come early into leaf. There are some dry gravelly knolls exposed to sunshine, which early in spring imbibe heat, raising the temperature of the soil, and rendering it quite unfit for growing a crop of larch of any kind. The check which the foliage is apt to receive in the first of summer, also points to the necessity of affording the tree ample space in order that it may not suffer at the same time from a diminution of foliage brought on by confinement. All the celebrated trees that I know throughout Scotland have had ample space for their branches and leaves at every stage of their growth. I believe the principal cause of the heart rot, known under the term "pumping," is occasioned by the want of the full development of the foliage of the tree, so that the sap fails to be elaborated, which is absolutely necessary for the formation of sound timber. Wherever you see a large or valuable growing trunk of larch, it invariably is accompanied with a proportionate display of branches and foliage. When the larch was a rare plant and newly introduced, it was afforded sufficient space, and to this circumstance alone I attribute the healthy and sound state of the old trees throughout Scotland. The line of old larches on the estate of Monymusk, the best I have ever seen, were planted in the year 1740; some of these now contain nearly 300 cubic feet, and formed respectively from 40 to 60 feet of timber in the space of ten years, after having arrived at the age of a hundred years. One of these trees of the height of about 100 feet, was blown down in 1860, and was found to be quite sound and free

from heart disease, which I attribute to the ample space allowed for its development. The magnificent larches in this quarter stand on a soft alluvial soil, with a gravelly bottom, on the banks of a mountain stream; and though the surface of the ground seems a perfect level, yet the trees having had sufficient space, cannot be said to have passed maturity at the age of about one hundred and twenty years.

Numerous instances of thriving plantations are to be met with on level ground; in such, however, it is especially necessary that ample space be allowed for their healthy development, taking care that the natural form of the tree be not altered by being pressed upon by a crowded state of the plantation. The aspect most favourable for the larch is a north or west slope, where it escapes the sunshine of a bright morning after frost, which may occur early in summer, and the soil most congenial is that which is soft and loamy, such as is frequently met with in the ravines and borders of streams; and although the roots of the plants may come in contact with rills from higher grounds, yet if the water finds a ready exit and does not stagnate, the tree is not found to suffer thereby. Soil of any description resting on moorband or till, impregnated with irony or ferruginous substances, attracts frost, retains moisture, and is unfavourable for the tree, particularly on flat ground. The fastest growing young larches that I know stand in a sheltered situation with good drainage, in the parish of New Spynie, on a light open soil incumbent on sandstone; these trees stand in a single line, with an arable field on the one hand and a road on the other; they were planted seven years ago when they were three years old, and about two feet high, and now at the age of ten years some of them measure upwards of 22 feet in height, and 22 inches in girth near the surface of the ground; and during the last three years I have frequently measured the progress of one of them, which in that time has grown a few inches over 10 feet. They appear to be the red variety, but as none of them have yet blossomed this cannot be positively asserted.

In the management of larch plantations there is no greater mistake committed than that of allowing the trees to advance too far without sufficient space; it is no unusual thing to see trees drawn up to a great height, with bare trunks supporting only a scanty supply of foliage near the top. In such places the trees next the roadsides have much stouter trunks, their additional support being derived from the branches they extend towards the open space afforded by the roadway. At the junction of roads the corner tree usually exhibits a striking illustration of the advantage imparted by a free circulation of the atmosphere, and is sometimes found to be more valuable than five or six of the average size of trees in the interior. Thus the loss to the country in the mismanagement of larch wood is greater far than in that of any other cultivated crop. The trees in forming a plantation are generally of an equal size and age, and dur-

ing the period between the tenth and twentieth years of their growth, they often receive injury through confinement, which never can be remedied by after thinning, the best of the trees being pressed out of their natural proportions, never thereafter to regain their full vigour. On seeing a larch plantation felled lately, about sixty years old, I observed in the interior, where the trees had been most confined, that a great proportion of them had become hollow in the centre, particularly those whose diameter was smaller than it should have been at that age. Along the outsides the trees stood much thinner, with trunks much larger, more valuable, and exempt from disease, with the exception of one close to the outside; this one, though to some extent unsound, had the hollow part at one side of the trunk, with the centre circles of the first fifteen or twenty years' growth, quite sound, and as the decayed part seemed to proceed from a large root which spread towards the outside of the plantation, I had the earth excavated and the root laid bare, when I found that it had extended to the distance of 6 or 7 feet when it came in contact with a rotten post which had formed the fence of the garden of an adjoining crofter; the larch root at this point was decayed, and like the old post was white all over with mycelium or the spawn of fungi. Mycelia are known to be often fatal to the larch at any stage of its growth, and are most so to trees with an insufficient supply of foliage, through mismanagement, or by any casualty befalling the leaves during the season of growth.

There are other varieties of the European larch which are to be found in some catalogues, and named from a peculiarity in the structure of their branches, such as *Pendula, Repens, Compacta,* and *Laxa,* but none of these as timber trees are improvements on the common variety, and they are apt to lose their peculiarities on being raised from seed.

These two kinds, *Larix Microcarpa,* the red American larch, and *Larix Pendula,* the black American larch, are now less cultivated than they were twenty years ago. Their timber is said to be much esteemed in North America, on account of its strength and durability, but in this country they are both found to be less vigorous than the common larch. They assume a more straggling habit of growth, are very subject to disease, and are now seldom sought after even for the sake of variety.

Larix Griffithii or *Griffithiana,* the Sikkim larch, is found in Sikkim, Bhotan, and in Eastern Nepaul, close to the snow-line, at an elevation of eleven or twelve thousand feet. It was in the spring of 1857 that my notice was first directed to this species by receiving from a friend a small parcel of its seeds about an ounce in weight. It was said to be quite hardy; these were sown in the end of April, in a spot of well prepared ground, measuring about two square yards; the produce was about two hundred plants, which during the first summer attained an average height of three or four inches.

As they had room enough they were allowed to stand two summers in the seed-bed when they were barely a foot high, but very stout in proportion to their height. They were then transplanted into lines. Early in the ensuing summer, when the plants had just broken into leaf, a frosty night succeeded by bright sunshine completely destroyed their expanded foliage, and, strange enough, a few days thereafter the plants appeared quite white, being covered over with the larch aphis, *coccus laricis.** Where these insects came from appeared very mysterious; no insects of the kind could be observed nearer than a mixed plantation which stood several hundred yards distant, containing a few thriving larches on a northern slope, and on which insects might have been found, although the plants presented no appearance of being infested by them. The night of frost referred to had only a slight effect on common larch plants of the same age, and on which no insect could be found although searched for, being much later in coming into leaf. The remedy applied to the diseased plants was a sponging with soap suds. Warm and favourable weather ensuing, the plants in course of a few weeks appeared in new foliage, and no more insects were visible during that summer. The following year being favourable for their growth they became shapely plants, and averaged fully two feet high, stout in proportion, and displaying a foliage longer and broader, and much more thickly set than that on the common larch. The leaves ripened off in a rich yellowish-brown colour, and when shed, formed a thick layer on the surface of the ground, twice more abundant than that from the common tree, giving great promise of becoming valuable as a tree adapted for enriching the surface soil of barren tracts and sandy situations. As the plants were quite exposed to the frost so fatal to exotics at Christmas 1860, and as they received no injury whatever, they were looked on as a valuable introduction to this country. To keep these plants in proper form and their roots in a fibrous state, they were again transplanted early in spring 1861, and allowed a greater space. Their growth was early excited by the mildness of the weather in the following April, the mean temperature of which was 3.1° higher than the average of April for the five preceding years; early in May also the weather

* Respecting some kinds of aphis, the late lamented John Curtis has stated the startling fact that the spring broods are all females, and do not require any intercourse of the sexes to render them prolific. They are pregnant at their birth, and if the nit (as it is termed) brought forth by the fly in the spring, be taken and kept entirely excluded from its companions, it will be able to produce young, and if one of these be treated with the same precaution, it will yet be found to retain the same powers of conception: and thus one may proceed for twenty or thirty generations. This will explain their otherwise marvellous multiplication, and the warmer the weather the more rapidly families increase; so that it has been calculated by an eminent naturalist, that from *one* egg 729,000,000 of plant lice might be produced in seven generations; admitting forty to be the maximum, and twenty the minimum, the average would be thirty, and the generations from the spring to the autumn amount from sixteen to twenty or upwards.

was warm and the ground dry, and not only were the buds expanded, but young shoots were apparent. On the 10th of May the thermometer exposed reached 81°, while on the following night or morning of the 11th it descended to 19°, being 13° below the freezing point. The effect was fatal; the leaves and tender twigs hung down, the plants presented a dead and withered appearance, and in course of a week were again completely encased with the *coccus laricis* as if white-washed. Although life lingers in a small minority which makes an effort to push young shoots near the surface, none will regain their vigour, and they are of no value. On occasion of this frost the common larch in nurseries and in plantations suffered severely, more especially those plantations which stood on dry warm soil with a southern exposure. In many such places the attack of the insects was so severe that the trees scarcely became clothed in foliage before the end of June. Larch in this description of soil becomes a very precarious crop, and when planted in such it should be mixed with some other more reliable tree. So far as my experience extends, none of the species of larch is adapted for cultivation in this country for the sake of its timber except the *Larix Europœa*, and the remark of Parkinson, the London apothecary, written 230 years ago, with respect to the common tree, will hold good as to all the other species, that "they are nursed up but with few, and those only lovers of variety."

EXPERIMENTAL AGRICULTURE, AND THE MODE IN WHICH IT MAY BE PROMOTED.

By Thomas Anderson, M.D., F.R.S.E., Chemist to the Society.

[Part of the following paper formed the Address delivered at the Stirling Show, but it has since been revised and materially added to, and now contains some minute directions for particular experiments, to which I would direct the special attention of those interested in experimental agriculture.]

When the agriculture of the early part of the century is compared with that of the present day, it is very evident that its marvellous progress must be attributed to a variety of circumstances. The increase of the population, and of the national wealth, and the growing intelligence of the people, have all tended to promote it; but their influence may be described as to a certain extent unavoidable, and they are in no degree special to agriculture, but have acted with equal force on every department

of the arts and manufactures. While due weight must be given to these and other similar causes, we naturally look with greater interest to those which have exerted a more special effect on agriculture itself, and have caused it to advance with, perhaps, greater rapidity than any other art. This rapid progress is largely due to its having called in extraneous aid. It has applied to the mechanician to devise new implements and machines better fitted to fulfil their objects than those previously in use; to the chemist, the physiologist, and the meteorologist, to explain the natural laws on which it depends—and these branches of knowledge have brought to bear upon it the results of much laborious work—a great part of which was accumulated at a time when it was not even imagined that it could become useful to agriculture, and when the teachings of science were often considered visionary and unpractical. The farmer has not been slow to take advantage of the assistance which these sciences afford him, but has recognised the fact that his art is a complex one, founded on many branches of human knowledge, with which he may usefully co-operate in advancing it; and in this recognition of the necessity for aid and assistance, as well as for active exertion in determining their principles, lies the great guarantee for the progress of all the arts. In the early stage of their existence, those who practise them not only remain within the circle of their own knowledge, but they are content to be, to a great extent, passive agents, adopting such improvements as come in their way, but rarely going out of the beaten track to seek for them, and hence that slow progress which contrasts so strikingly with the rapid development which is sure to occur when men's minds are directed to what is new.

In no art, perhaps, is the contrast between these two stages of its existence more striking than in agriculture. The farmer of the last century was content to do as his fathers had done before him, and ploughed and manured in certain ways, because it had been the custom to do so from time immemorial. If he possessed superior powers of observation (a far rarer gift than is generally supposed), he noted what occurred on his own or his neighbours' farms; and if it happened that any particular operation was attended by favourable results, he adopted it in future years. It will be readily understood that, so long as this method was followed, the progress of agriculture was necessarily slow, for it depended not merely on the chance of a particular result occurring, but of its occurring under the eye of an individual possessing the qualifications necessary to enable him to take advantage of it, and even when thus observed, the knowledge acquired passed but slowly from man to man, and many years elapsed before it became generally known, for there was then no agricultural press to diffuse the knowledge of it over the country, and no agricultural societies

in which its good effects could be discussed. Very striking is the contrast between this state of things and the active watchfulness of the modern farmer, ever on the alert for what is new, rapidly taking advantage of every step that is made, and anxious to do what in him lies to contribute to the general fund of information.

Amidst the various methods by which agriculture may be promoted, the claims of experiment have not been overlooked, and the farmer has of late years devoted much time and labour to this important means of establishing the principles on which his art depends. Experimental inquiry has indeed, in a certain sense, produced a revolution in agriculture, for it has raised it to the dignity of a science, and shown that it depends on general principles which it is possible for the farmer to develop and establish on a sure and firm foundation. It was the introduction of artificial manures about twenty or twenty-five years ago which gave the great stimulus to experimental agriculture. The inquiries which had been made previous to that time were for the most part purely scientific, and though the practical conclusions to be drawn from them were important, they were scarcely known to agriculturists, and excited little attention among them. The important researches of Saussure, which form the foundation of scientific agriculture, though made seventy or eighty years since, and their connection with practice constantly pointed out by the author, were unknown to farmers until within the last twenty years, and even the investigation of the properties of the soil by Von Thaer and others, though their practical bearings were more immediately obvious, had attracted no attention out of Germany. But when guano and other light manures were introduced, the utility and advantage of trying them experimentally on the small scale was immediately apparent, and when ground was once broken in this direction, the importance of following it out, and giving it a wide and general application in the practice of agriculture could not be overlooked. Agricultural experiments, accordingly, soon became general, and nowhere have they been made with greater zeal and activity than in our own country, and their number and accuracy are very greatly due to the fostering care of the Highland and Agricultural Society. Upwards of twenty years ago, the Society commenced offering prizes for reports of experiments, and it has continued to do so ever since, and at the present moment the pages of its Transactions probably contain a larger number of careful and accurate experiments than those of any similar periodical. Every year the subject receives new attention; and the premium book contains a series of suggestions for experiments, selected by a committee, including a large number of the most experienced practical farmers, as being those which especially merit investigation, and are likely to give results useful to agriculture.

Although many good experiments have been made by farmers

both in this country and elsewhere, it will be admitted by all, and most readily by those most thoroughly conversant with the subject, that their number might be advantageously increased; new subjects of inquiry suggested by those which have already been made might be undertaken, and additional value given to them by the adoption of a more systematic plan than has hitherto been customary. It is with the view of pointing out how this may be most readily attained that I propose to discuss the whole subject on the present occasion, treating both of the aim and object of experiments, the mode in which they should be made, and the various precautions necessary to secure accuracy. I am the more induced to do this because it has been erroneously alleged that I am inclined to depreciate experimental agriculture, than which there cannot be a greater misapprehension; so far from this being the case, I have never lost an opportunity of doing all in my power to promote it. By many elaborate analyses I have sought to give completeness and precision to the results obtained in the field, and have always expressed my appreciation of the care and accuracy of those who have devoted themselves to such inquiries. It is clear, however, that the time has now arrived when experiments might be undertaken with wider objects than those with which we have hitherto been satisfied, and that the progress of agriculture, while it demands more minute and extensive inquiries, affords also the means of accomplishing them. It was not long since remarked to me by a distinguished agriculturist, who has himself made many accurate and well devised experiments, that he thought farmers had got too much into a beaten track, and went on repeating the same experiments over and over again; and in this there is certainly some degree of truth; and without undervaluing repeated experiments, the great importance of which will be afterwards pointed out, there is no doubt that new subjects of inquiry might be opened up with the effect of interesting a greater number of persons, and inducing them to enter into this field of usefulness. The fact is, that from the very nature of things the field of experiment increases every year. As our knowledge advances, new subjects suggest themselves, and it frequently happens that the result of one series of experiments gives the first indication of the necessity for another; or they may show that the method which appeared well adapted to elucidate the required facts is not sufficient for the purpose, and render it necessary to throw overboard what had been done, and to commence again *ab initio*. In such a case it may seem that the labour expended has been lost, though such is not really the case, these imperfect experiments being a necessary step towards the more perfect. To criticise such experiments, and to point out their defects, is not, therefore, to disparage them. The results may have been the best possible under the circumstances,

the precautions adopted all such as were then supposed necessary; it is only one of the necessary consequences of scientific progress that they should be superseded by others; and it must be a very rare case that any one looking back upon experiments made by himself ten or twenty years before, could assert that, if he were to perform them again, he would adopt exactly the same methods.

Every step which our knowledge makes involves greater or less change in the methods of investigation, greater care and minuteness are necessary, and improvements are introduced, so that no experiments can be considered as final, but all must be repeated and revised at more or less distant intervals of time.

Without at the moment entering more fully into this question, it may be laid down as a fundamental position, that, in the present condition of agriculture, experiments are one of the most indispensable means of promoting it, both in its practical and scientific relations; and further, that unless they are made with great minuteness and accuracy, they are not only useless, but worse than useless; and as the necessary precision and accuracy render them extremely laborious, it is of the utmost importance that the efforts of those who undertake them should be directed into the most profitable channels, so that the maximum of useful results may be obtained with the smallest practicable expenditure of labour.

In considering the matter, it may be observed at the outset that all agricultural experiments may be divided into two great classes, one set leading to *special*, the other to *general*, conclusions; the first having for its object the determination of particular facts, the second the establishment of general principles. As an illustration of the first of these, we may take the case of experiments made by a farmer, in which he contrasts two or more manures with one another, for the sake of satisfying himself as to which it will be most profitable for him to use on his own farm. If he obtains a definite result, the immediate and tangible gain is obvious, because he is enabled to introduce a material economy by confining himself in future years to that manure which proved most advantageous. But it by no means follows that the result shall be of any use to his neighbour, for the nature of the soils may affect the results; and even where they are completely identical, differences in height and exposure, or in the meteorological conditions, may completely alter the circumstances.

If the effect of other manures on his own and his neighbour's farm is generally identical or similar, the probability is that the results of the experiment will be equally valuable to both; but if the reverse is the case, the experiment, though valuable to the one individual, will be useless to the other. Neither is the result of one experiment such as can be invariably relied upon, for the effect in a dry season may be totally different from that pro-

duced by the same manure when the rainfall is large. We are here, of course, supposing an extreme case; for it must necessarily be a rare occurrence that an experiment made by a farmer for his own use can be altogether devoid of instruction or value to others; but it may very frequently happen that an individual, when experimenting for his own benefit, may adopt a kind of inquiry very different from that which he would select if his object were the instruction of the agricultural public. The other class of experiments, which are directed to the general advantage of agriculture, have a higher aim, for they seek to establish some general principle or principles which underlie its practice, and thus enable us to generalise, as it is called in scientific language, that is, to draw conclusions which are not only true in a few special cases, but, if rightly used, are applicable under a great variety of apparently different conditions. Such experiments, for example, would take a manure not as a whole, but would dissect it, as it were, and, selecting each of its constituents separately, would endeavour to ascertain what part of the total manurial effect it produced was due to each of them; and if this course were pursued with a variety of substances, it would be possible, when a sufficient number of experiments had been accumulated, to predict the result which ought to be produced by any particular mixture under any circumstances. The great laws by which the action of manures is governed would thus be established, and a knowledge obtained which would be valuable in all time coming, and in every possible condition. There is, however, a very important difference between these two classes of experiments, inasmuch as those made with a special object give an immediate answer of some kind or other, and decide, even when repeated only a few times, which is the most useful manure to employ in any particular case, while those made for the purpose of determining general principles must be frequently repeated and varied in every possible way, and may be carried on for a great number of years, and with the expenditure of much time and labour, before any satisfactory conclusions whatever can be drawn from them.

With such a difference it will be no matter of surprise that the majority of experiments hitherto made should belong to the former class, and comparatively few to the latter, which at first sight appears of a more abstract character and less immediately applicable to practice. It is for this reason that the prizes offered by this Society for special experiments have generally been well competed for, while those which seek to determine general laws have attracted comparatively little attention, though they are really the most important. Nor can the preference excite much surprise, for it is only consistent with the desire every one has to see his own labours producing an immediate practical result, and disinclination to engage in the slower and less attractive duty of storing up facts

from which no safe conclusions can be drawn until they have been accumulated during many years.

Yet this patient accumulation is indispensable to the proper foundation of scientific principles. Its necessity is recognised in all the sciences, and it is very forcibly illustrated by the astronomer, who is often compelled to wait for many years until the recurring course of events enables him to observe the facts he requires, and he is content to go on year after year amassing facts by which his successors are destined to profit. The agriculturist is in a somewhat similar predicament. His experiments necessarily extend over an entire season, and are exposed to the disturbing effects of weather, and many other causes which, as every one well knows, tend to invalidate or at least to affect the accuracy of the conclusions to be drawn from them, and are often very disheartening to the experimenter. Perseverance should indeed be the motto of the agricultural experimenter. He should remember that his results are valuable in proportion to their number, for it is frequent repetition which enables us to eliminate the effect of soil and weather and give precision and certainty to his results.

The observations I propose to make on the subject of agricultural experiment may be divided into three parts: 1st, The precautions necessary to secure accuracy and success; 2d, The suggestion of some subjects especially meriting attention; and, 3d, The best modes in which experimental agriculture can be promoted.

1st.—*The precautions necessary to secure accuracy and success.*

It is of primary importance that the experimenter should not set to work in a desultory or random manner, but should lay down for himself some particular line of inquiry. He should select some definite question or questions for solution, and as a general rule the more limited these questions are the better, especially if he has no previous experience. Having formed a clear idea of what it is he wishes to ascertain, he should set himself to the consideration of the form which his inquiries ought to take, in order that a definite answer may be obtained from them. He should particularly attend to any sources of fallacy that may be involved in them, and the possibility of their results being thus rendered dubious and uncertain; and he should bear in mind that an inaccurate experiment is not only useless but misleading, and that the omission of some apparently unimportant piece of information may deprive an otherwise excellent experiment of half its value.

Above all things, it is important to avoid undertaking too much, and there is no error into which the young experimenter is more apt to fall. He finds no difficulty at seed-time in commencing a large number of experiments, and it is only in autumn when many plots are to be separately harvested and weighed

within a very short time that the difficulty becomes apparent, and he is compelled either to abandon a number of them and lose his preliminary labour, or, what is still worse, to hurry through the weighings at the risk of committing errors which cannot be afterwards corrected, or possibly not even detected. He should bear in mind, also, that the value of agricultural experiments is greatly increased by their repetition on several successive years on exactly the same plan, and it is very desirable that he should make his arrangements so as to secure this, and that he should confine himself to one subject, until he has exhausted it as far as circumstances will permit, rather than fly to another and unconnected investigation.

When the subject of inquiry has been selected, it becomes necessary to ascertain the exact state of the information regarding it. For which purpose the agricultural literature should be carefully examined, the opinions entertained by intelligent farmers examined, and any previous experiments bearing upon it minutely studied. If this be properly done, much labour and unnecessary repetition may be avoided, especially if care be taken to trace the weak points so that the same errors and defects may not occur in those about to be commenced. These matters having been arranged, it is well to consider whether the experiments about to be begun might not at the same time throw light on some points not included in the original plan, or be made to do so by some slight modification in the mode of carrying them out, without detracting from their accuracy in relation to their primary object. These arrangements should, if possible, be made long before the time at which it is necessary to commence the experiments, so that the plan may be well digested and nothing of importance be overlooked.

The plan of the experiments having been definitely arranged, the next matter for consideration is the field in which the experiment is to be made, and to this very great attention should be paid. It is of primary importance that the soil shall be as uniform in quality and texture as possible. Absolute uniformity can rarely be secured, but every effort should be made to come as near it as circumstances will permit; and if the experimenter wishes to give the highest degree of accuracy to his results he will endeavour to produce some experimental evidence of the uniformity of his soil, or of the limits within which the produce of different parts of it differ—a point in regard to which most experiments are very deficient. Preference should always be given to a field which is perfectly flat, for undulations on the surface are generally connected with differences in the soil or subsoil, and are often due to the existence of rocks beneath, which may greatly modify the nature and quality of the superincumbent soil, as well as the drainage of particular spots. On a

considerable slope the soil can never be uniform, as any one may easily convince himself when the state of a ploughed field, on even a very moderate inclination, is examined after a heavy fall of rain. The furrows at the lower part of the field will then be often seen filled with matters washed down from the higher level, and what is there deposited is sometimes the coarser sandy part of the soil, the finely divided clay, which is generally its most valuable portion, having been carried off to the ditches or drains; while at other times, and more particularly when the slope is gentle, the finer particles are deposited at the bottom, and the coarser left behind. Whichever of these be the case, it is very manifest that the effect is to create a difference between the two portions of the field, which must, in the course of time, become considerable.

It will sometimes happen that a slope is the only part of a farm available for experiments, and, in that case, the plots for the different substances should be arranged in a single row along the middle of it, the upper part of each being at the same distance from the top. In this way the chances are that all of them will be fairly comparable with one another; but it must never be forgotten, that though experiments in such a soil are admissible, they are open to some risk of fallacy, which can only be avoided by the greatest possible care. The importance of uniformity of soil is so obvious, that there is scarcely an experiment on record in which reference is not made to it, and a statement given that the portions selected for the experiments were suitable in this respect, although it generally amounts to no more than an assertion of the fact, which, it may be inferred, has been determined merely by ocular inspection. But as this is liable to be fallacious, it would be infinitely preferable if some more precise method of ascertaining it were adopted; and this could be readily done by deciding on the nature of the experiments, and the position of the plots a year beforehand. The plots should then be at once staked out, and the crop being raised in the usual way, the produce of each should be harvested and weighed separately, and if it proved equal in all cases, the soil would be perfectly uniform. I am not acquainted with any experiments in which this precaution has been taken—indeed, I believe it is now suggested for the first time; but there can be no doubt that the year's delay, and greatly increased labour, would be amply repaid by the additional value and precision of the results.

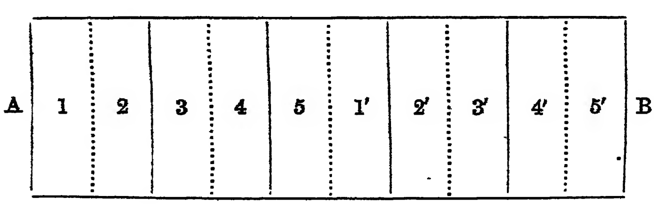
The condition of the soil is another matter of great importance, which exercises an important influence on the results of all experiments, and to which very great attention should be paid. Although not without exception, it may be stated as a general rule, that experiments are most satisfactory when made on soils which have been for some time under careful cultivation, for by

this means equality of texture is most readily secured. The mechanical operations of husbandry undoubtedly tend to diminish the local peculiarities of a soil, and repeated manuring also brings the different parts of a field more nearly into the same state as a source of plant-food. On the other hand, it is most especially necessary to avoid those which are in the highest condition, or which have been recently and heavily manured. For it is very obvious, that if the soil be already so charged with manurial matter, as to enable it to produce a full crop, the application of an additional quantity may have little or no effect. In some cases, it may, however, be desirable to ascertain, whether a particular manure may not have the effect of increasing the crop even in such circumstances, by causing that already present in the soil to exert a more rapid action. But these are special cases, and for ordinary experiments it is in general best to select a soil which has been well worked, but not highly manured, because on it the differences between the manures employed will be most marked.

Not less important is the consideration of the size of the plots on which the experiments should be made; a subject of some difficulty, and in regard to which very great difference of opinion exists. The general impression is, that the larger they are the better; and it has been held by some that no experiment should be made on less than an acre, while others have made half an acre their standard; and still smaller quantities, down, in some instances, to a very small fraction of an acre, have been used. It seems to me that no good general rule can be laid down for our guidance in this respect, and that much must depend on the object of the experiments, and the circumstances under which each individual investigator is placed. If, for example, the object be to grow a crop by means of different manures, and then ascertain the relative nutritive values of the produce by feeding experiments on cattle, it is very obvious that no results worth having can be got except by working on a considerable scale; and even an acre may be too small a quantity to give good and trustworthy results. On the other hand, where it is merely intended to compare the weight of the produce, that quantity is unquestionably far too large.

Without undervaluing the advantages of large plots, some of which are sufficiently obvious, I have no hesitation in saying that experiments on a small scale offer great conveniences, and when made with the necessary care, are quite as accurate, if not more so. The arguments which have been brought forward in support of large experiments, are chiefly that the crop can be raised more in accordance with the ordinary methods of cultivation than on small plots; that local inequalities of soil are, to a great extent, avoided, and that a fairer average is obtained. When small ex-

periments are made, it is argued that, from some unexpected or unobserved peculiarity of the soil, one or more plots may be greatly superior or inferior to the others, and the result of the experiments would be to place the manures used on them in a position above or below that which they ought to occupy. It will be observed, however, that this argument proceeds on the assumption that no method other than the fallacious one of ocular inspection has been used to ascertain the uniformity of the soil. If the mode of testing this point by weighing the produce of the ordinary crop in previous years, already adverted to, had been used, this difficulty would have been avoided. The fact is, that though large plots may have the advantage of eliminating any local peculiarity of the soil, they are no guarantee for its uniformity in respect to gradual changes. It frequently happens that a field is heavy at one end, and gradually shades off into a lighter soil at the other; and when this is the case large plots are very disadvantageous, because such differences are peculiarly apt to escape detection, though they may greatly affect the results of the experiments. In such a case as this, the advantages derived from large plots are very questionable. The results would in fact be greatly inferior in accuracy to those obtained by reducing the size of the plots, and making the experiments in duplicate or triplicate. Supposing it be resolved to make only five experiments on an acre each, this requires five acres in all; and no one familiar with the matter will hesitate to say that there is nothing more difficult than to find that quantity of soil of the necessary uniformity. In such a case it would be infinitely preferable to use half-acre plots, and to make a duplicate experiment; while in all probability a fourth or even an eighth of an acre would give still more accurate results. Supposing, for example, the five acres to be on a field whose soil became gradually lighter from A to B in the



following diagram, a far more accurate result would be obtained by dividing each acre in half, as represented by the dotted lines, and repeating the experiments in the manner shown by the numbers in the plots. Thus No. 1 and No. 1′ manured in the same way would be compared with one another, and the effect of difference of soil on the produce be eliminated. And still greater precision would be ob-

tained by dividing the whole five acres into 20 quarter acres, and making a fourfold experiment.

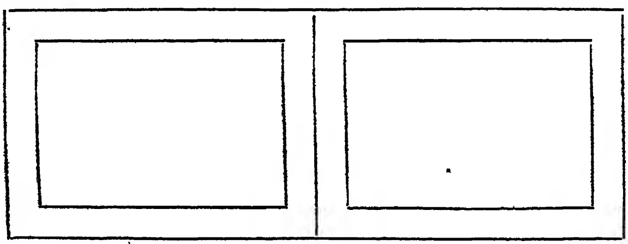
It is urged, also, that on large plots the crop can be more easily harvested, and more accurately weighed, than is possible when they are of small size; but this is only because experimenters generally are content with the rude weighings which suffice for the ordinary farm purposes, while if they used a somewhat more refined apparatus, equal if not greater accuracy could be obtained in the small scale. The fact is, that particular methods and arrangements must be employed to secure the requisite precision.

It is in general advisable that each experimenter should be left to decide very much for himself as to the size of the plots he is to use, and he will necessarily be guided to some extent by the nature of the experiments to be undertaken. Where the object is merely to make what we have called special experiments, a considerable breadth of land is best, but it need never exceed a quarter, or at most half an acre—a quantity amply sufficient to give a fair average of the whole field. Where, however, the intention of the experimenter is to contribute to our knowledge of the general principles of agricultural science, much smaller quantities of land will suffice, and 1-20th or even 1-100th of an acre will often be sufficient. It is probable, indeed, that the results obtained from these small quantities are really much more accurate than where larger plots are used, and the facilities for making many experiments are so great that no one who has once tried them with proper precautions will ever return to large ones. On this point I may quote the experience of Mr Thomson, Grange, Kilmarnock, who has for some years devoted much attention to agricultural experiments. He informs me that in his first year he used plots of an acre, in the second of a quarter of an acre, and in neither year did he consider his results sufficiently accurate for publication. He then used 1-30th, and during the season just passed 1-60th and 1-120th have been the sizes, and the experiments have been greatly superior in accuracy.

Mr Thomson has recently suggested the use of plots of 1-112th of an acre, which presents many important advantages in weighing both the manure and the produce. Every pound weight would in such a case represent a hundredweight in the acre, and the whole of the calculations are thereby much facilitated.

It has been frequently objected to small experiments, that they do not give a fair estimate of the produce which may be obtained over the whole field. But this objection has really little weight, for it must be remembered that it is only comparative results that are wanted, and it does not matter whether the produce from the plots be above or below the average over the whole field, provided only they be made under precisely similar circumstances, and are fairly comparable among themselves. Another error peculiar to

small experiments which has been pointed out is, that when the crop is of a kind which throws out long roots, it is possible that the mutual interpenetration of the roots of adjoining plots may occur to such an extent as to interfere, to some extent, with the accuracy of the results. If, for example, a plot to which nothing has been applied adjoin one which has been heavily manured, some of the roots from the outer part of the former will penetrate into the latter, so that its produce will be somewhat increased; while, in the same way, the outer plants of the manured soil will stretch into the unmanured, and the difference between the produce will consequently be less marked than it ought to be. This difficulty can, however, be easily overcome by a slight separation of the plots by a sort of outer rim. If, for example, it be resolved to make the experiments, say on a fiftieth of an acre, the space should be measured off by fortieths for manuring, while the portions actually weighed should be in each only 1-50th of an acre in the centre of each 40th. So that the field would be arranged somewhat as in this diagram, where the inner rectangles represent



the quantities to be weighed, and the outer those manured. It is obvious that when the plots are large, any error occurring by the interpenetration of roots would be too trifling to merit notice, and it would be noticed only in the cereals in which the drills are close to one another, and would be quite unimportant in root crops. In any case the error produced by it could only become important when the plots reached certain dimensions. At what size this would occur it is impossible to say; and a few experiments to throw light on this point would be useful. In general, the line of demarcation between two plots differently manured is distinct and well marked, and there is no appearance of gradual shading from the one into the other, as should be the case if the interpenetration took place to a material extent. On the whole, I am of opinion that it is only in extremely small plots that it would be necessary to take this precaution; and Mr Thomson, to whose experience in small experiments I have already alluded, holds this opinion. It is clear that if it is unnecessary to have the outer rim the experimenter would be saved much additional labour, which the observance of this precaution would necessitate.

Another objection to small experiments is the difficulty experienced in gathering the crop, without overstepping the boundaries of the plots, which, when they are small, may lead to great inaccuracies.

This difficulty, of course, can only be encountered in the cereal crops, and I recognised it very clearly some years since, when engaged in examining the progress of vegetation in the wheat crop, where, from the very nature of the inquiry, it was indispensable to work on a very small scale, and I took some pains to devise a mode of overcoming it. The plan I then adopted, which proved completely successful in practice, was to measure out the spaces with great care, and to drive firm pins, projecting about six or eight inches above the surface, into the corners, between which slender wires were stretched, so that when the produce was required it could be cut with the greatest certainty; in reaping the crop, the hand being run along the wires, and only the plants taken which were included within them. This plan has recently been adopted at my suggestion by Mr Thomson, who expresses himself highly satisfied with it.

There can be no doubt that, when such precautions are taken, small experiments will be in many cases more accurate than large ones. And, in this respect, agriculture would only be in the position of the other sciences. In chemistry, for example, the experimenters of the sixteenth century used pounds, and those of the eighteenth ounces, where we use grains, while there is no comparison whatever between the accuracy of the results. It must not be supposed, however, that the use of small plots makes experiments easy; the very reverse of this is the case, and it will be found by those who undertake them that they require greater care and attention to minutiæ; but, on the other hand, a greater number can be made, and they are more rapidly performed. This is really a matter of great moment, because the experimenter can then superintend personally the whole operations, whereas, where the plots are large, he is almost of necessity compelled to leave a considerable part of them in the hands of ordinary farm labourers, who cannot always be trusted to carry out with intelligence the instructions given them.

There is no question at all that if farmers are satisfied with small experiments, the number and variety of those performed is likely to increase very greatly, because they can be carried on at a much smaller expense than large experiments, and a larger number of individuals will thus be induced to engage in them. At the present moment, when they are made on half or quarter acres, the expense and trouble are so great that many persons who would willingly embark in investigations are deterred from it. For not only is the expense of the manures often serious, but the breadth of land the experiments occupy may interfere with

the general working of the farm. In these cases, also, the experimenter is sure to arrange his work so that the crop shall in all cases be remunerative, although this is not always the best condition for elucidating scientific principles. An experiment may be a failure in one sense, inasmuch as it may show that the manure used produced no practical benefit, but it may not only be a failure in a scientific sense, but may actually contribute very greatly to the establishment of important principles. It may even be most desirable that experiments likely to give negative results should be made, but it is not to be expected that farmers will be found ready to sacrifice the produce of a whole acre though they might not object to losing that of a smaller space.

An impartial consideration of all the arguments which have been brought forward in support of large and small experiments leads to the conclusion that the latter should be more encouraged than they have been, provided they be made with the necessary precautions, not certainly to the exclusion of large experiments, some of which it would be always advisable to conduct, but because, by giving due weight to them, we should undoubtedly induce many more persons to engage in these interesting and useful inquiries.

On the whole I am inclined to recommend the use as a standard of the 1-112th of an acre, as proposed by Mr Thomson, owing to the great advantages it offers for calculations, but other quantities may be used provided they be always definite fractions of an acre. It is advisable, however, that the plots should in all cases be laid out in a definite plan, and their width will necessarily be dictated by that of the ridges in which the land is ploughed. In moist climates these are generally made from 15 to 18 feet in width, but the most common as well as convenient is 16 feet 6 inches (an imperial pole). The following table gives the length which a plot must have at each of these breadths to give 1-112th of an acre:—

15 feet wide	25 feet 11 inches
16 feet 6 inches	23 feet 7 inches
18 feet	21 feet 7 inches

Should it be thought desirable to employ 1-100th of an acre the lengths would be—

15 feet	28 feet
16 feet 6 inches	26 feet 5 inches
18 feet	24 feet

For root crops it would be necessary to proceed by drills, and if they be 27 inches apart, a plot 4 drills wide and 43 feet 4 inches long would be 1-112th of an acre, and 1-100th of an acre 48 feet 5 inches long.

Whatever may be the size of the plots, the experimenter may resolve to employ, he should never forget that single experiments

have comparatively little value, and that every result to be trustworthy should be made in duplicate, and better still, if it is repeated three or even four times, on the same soil. So great is the importance of this precaution, that it may be safely asserted that if a person has resolved to set aside a sufficiency of land for experiments in half acre plots with ten manures, the value of his results would be increased fifty-fold by dividing each space into four, so as to make it a fourfold experiment. When they are made in duplicate or triplicate, it is very obvious that many of the uncertainties which beset a single experiment are got rid of. The risk of error from local peculiarities of soil is far more effectually avoided than it can be by increasing the size of the plots, and mistakes in weighing or measuring the land and produce, which, with every care, must sometimes occur, are greatly diminished. The disturbing causes which are not eliminated in this way are the effects due to the kind of soil and to meteorological conditions. These can only be ascertained by extending the experiments, so as to include different descriptions of soil, which may be selected in the immediate neighbourhood of one another, and localities differing in their temperature and rainfall, which must almost of necessity be at some distance apart.

For the complete elucidation of all the different bearings of the application of any manure it would obviously be necessary to take all these matters into consideration, but when this is well done, the scope of the experiments is so greatly extended as to make them far beyond the power of an individual, and such a plan could only be accomplished by several persons in different parts of the country associating themselves together for the purpose of repeating the same experiments, and to the value of such an arrangement reference will be afterwards made.

Of other necessary precautions several must be referred to. Among others, it is particularly desirable to notice the importance of leaving plots entirely without manure, a matter to which it would not be necessary to refer, had I not seen many series of well-performed experiments rendered comparatively useless by this omission, and I have felt great regret that experiments otherwise admirably executed, and which had clearly involved much labour, should have had their value diminished by an omission which might have been so easily supplied.

The nature of the manures to be used, and the best mode in which they are to be applied, must next be considered. They should, of course, be procured from dealers of reputation, so that their quality may be good. Before each is applied it should be turned out of the bags on a clean wooden or stone floor, and carefully mixed with the spade, any lumps contained in it being broken down. It should then be passed through a sieve and again mixed, and a sample selected for analysis by taking a handful

from six or eight different places in the bulk, mixing them carefully in a large sheet of paper, and putting two or three ounces of this into a wide-mouthed bottle. An analysis should then be made so that the exact composition of the substances actually used may be known—a precaution not only required for the purpose of ascertaining that it comes up to the proper standard, but also to enable the experimenter to calculate the quantities to be applied in particular experiments. The importance of this precaution is very great, and it should never be omitted, for mistakes will occur; in proof of which it may be mentioned that I have not long since examined a manure supplied for experimental purposes by a manufacturer of the highest standing, and stated to contain 38 per cent of soluble phosphates, in which only 28 per cent was found. It is scarcely necessary to observe that had the manure been used without analysis and on the faith of its containing 38 per cent, any conclusions drawn from the experimental results would have been completely fallacious.

These matters having been ascertained, and the quantites required for the different plots weighed out, they should be mixed with once or twice their bulk of *damp* but not wet sand, and the whole being again passed through a sieve, they should be put into bags ready for use. The object of mixing with sand is to admit of its uniform application, and to prevent the more dry and dusty manures being blown about by the wind during application. The importance of attending to this point is apt to be overlooked, but it becomes apparent when it is known that the application of one cwt. of a manure to the acre gives no more than 163 grains to each square yard of surface.

For still greater completeness the soil should also be examined, or at all events a sample should be taken just before the experiment is begun, which may be afterwards analysed should it be deemed necessary. For this purpose a hole should be dug to the depth of the soil, say 10 inches, and from its perpendicular side a slice 2 or 3 inches in thickness should be taken. This should be repeated at five or six different parts of the field, and the whole of the soil thus taken should be carefully mixed with the spade, passed through a coarse sieve, and spread out in a thin layer on large sheets of paper for some days to dry in the air, and 5 or 6 lb. fairly selected from this should be preserved in a tin box.

It would be still better to take two samples in exactly the same manner from different parts of the field, in order to see whether there is any marked difference in the chemical nature of the soil. For completeness, a mechanical analysis of the soil and examination of its physical properties should also be made; but this is a subject about which so little is known, and involving so extended an examination, that it will probably be omitted in all cases

except those in which an elaborate and continued series of experiments is intended to be made.

It is scarcely necessary to observe that during the growth of the crop attention should be paid to everything bearing on its progress, the time at which it brairds in each plot, when it comes into ear, if a cereal, and all similar events, being carefully noted. A knowledge of the rainfall and temperature during the time of the experiments is also of much importance, and the necessary information on these points, obtained from any meteorological observer in the neighbourhood will generally suffice. The most perfect plan would be to have a rainguage on the field itself, for it is well known that very slight differences in elevation and position sometimes materially affect the amount of rain, and if the strength of the solar rays were also observed, the results would doubtless be most interesting; but these are refinements which we can scarcely expect to see adopted in the present state of agriculture. When the crop approaches maturity, the proper time for harvesting becomes a matter demanding much careful consideration. The general system is to collect the produce from all the plots on the same day, and so far as root crops are concerned this is probably right, because there is no definite point at which they can be said to be ripe. But it is quite otherwise with the cereals. In them the period of exact maturity should be carefully attended to, and as the effect of some manures is to accelerate this point, it would be wrong to reap all the produce on the same day. If this be done, it is necessary either to wait till the latest plot is ripe, in which case some of the grains of the earlier ones are liable to be shed, particularly if the weather is windy, or to begin when the first is ripe, in which case the others are placed at a disadvantage. The experimenter must, therefore, examine the crop day by day and gather each when in the same condition as to ripeness.

The crop has next to be weighed, and in the case of roots, or other crops liable to undergo change, this must be done at once, the different parts (roots and tops) being weighed separately. With the cereals this operation may be delayed until a convenient time, provided the produce of each plot be carefully stored. Mr Thomson's plan of doing this is a very good one, but of course applicable only to small experiments. He takes into the field a large piece of coarse sheeting, and putting the whole produce of the plot into it, the corners are gathered together and tied, a label being at the same time attached, and the whole conveyed to the steading, where it is kept until time is found to weigh and thresh it, for which latter operation Mr Thomson has had a small hand-power thrashing-machine constructed.

Here the experiments terminate for the year, unless it be thought necessary to ascertain the nutritive value of the produce by analysis. Where the object is merely to determine the utility,

of different kinds of manures under special circumstances, this is not absolutely necessary, but where they have been made with the intention of contributing to our knowledge of the general principles of agriculture, it forms an important part of the inquiry. Suppose, for example, a set of experiments be made by applying different quantities of ammonia to the soil, it may become a question whether the larger applications may not, in addition to an increase of crop, also yield a produce richer in nitrogenous matters. In this case analysis is indispensable. But it is questionable whether, in the present state of experimental agriculture, it would be advisable to complicate matters by taking up this branch of the inquiry. It would at all events be superfluous in the great majority of investigations.

Although an ordinary series of experiments may be considered to end with the weighing of the crop, they would still leave an important question regarding the effects of the manure unsolved. Experience has shown that in most cases the increase on the produce contains only a very small proportion of the valuable matters supplied to it in the manures, and if the experiments are to be exhaustive, they ought to ascertain what has become of the remainder, and what effect it is capable of producing on subsequent crops.

The common impression among farmers is, that the effect of guano, superphosphate, and similar manures, terminates with the crop to which it is applied; and this opinion was based on the supposition, that as these substances contain their valuable matters in a more or less soluble form, that which the crop had not appropriated must have been washed out of the soil. But this supposition, so far at least as regards superphosphate, was always known to be unfounded, for chemistry teaches that the soluble phosphates of that manure, when mixed with the soil, are rendered insoluble by the lime, &c., existing in it, and the discovery of the absorptive power of the soil has shown that the same is true of ammonia and potash. As the valuable matters added to the soil in the manure unquestionably remain there and must add to the permanent fertility of the soil, it is very desirable that their effect on the subsequent crops should be ascertained. One of two things must occur. Either the residual part of the manure must exert a marked effect on the next crop, or, in consequence of its having become thoroughly incorporated with the soil, it has, so to speak, ceased to be manure, and become soil, in which case its valuable matters would be in no degree more available to the plant than those pre-existing in the soil, in which case no *perceptible* effect would be produced in future years. It is very desirable that this point should be investigated, and for this purpose it would be necessary to weigh the produce from the same plots, to which no manure of any kind has been applied in the mean time, in the

subsequent year, or, better still, during the remainder of the rotation. It is very difficult to accomplish this in a satisfactory manner, particularly with small plots, and hence the cases in which it has been attempted are very few, although the question is one of great importance and calls loudly for investigation.

I have now discussed the precautions necessary for obtaining complete and exhaustive results in one great class of agricultural experiments; but there is another of equal importance which have for their object the determination of the nutritive value of different substances by feeding experiments on stock. Experiments of this kind are more difficult and troublesome than those already considered, and involve so many appliances, and entail so material an outlay, that few persons are likely to engage in them with the minuteness and attention they require. For this reason, and also on account of the extent of the subject, it is not my intention to consider it at present, although I shall in all probability recur to it on a future occasion.

2d.—*Suggestions for Agricultural Experiments.*

The suggestion of individual experiments is a matter of some difficulty, and among the multiplicity of subjects requiring examination it is not easy to know where to begin. Only a few, therefore, can be pointed out here, but should those proposed be carried out and new ones required, it will be easy on future occasions to suggest others.

A.—Action of Phosphates in different conditions as Manures.

Experiments are required to determine the relative values of soluble phosphates derived from bone-ash and coprolites. The chemist sees no difference between them, but holds them to be chemically and mechanically identical, and this has been frequently urged on the farmer both by myself and other chemists. But a strong prejudice exists against them on the part of many practical agriculturists, and it is very important that it should be ascertained whether this is well founded or the reverse. For the purpose of elucidating this point, experiments might be easily made, and the plan most convenient for the purpose would be to fix upon a definite quantity of soluble phosphates to be applied to the acre. At the present moment a coprolite manure is applied at the rate of from 3 to 6 cwt. per acre, and as it usually contains about 23 to 25 per cent soluble phosphates, this amounts to from 75 to 150 lb. of these substances per acre. Let these quantities, therefore, be taken as the standard. Then the experimenter having got the analysis of his manure has to consider what quantities of it he must apply to the acre, so that he may supply it at the

rate of 75 lb. Supposing his manure to contain only 23 per cent of soluble phosphates—then as

$$23 : 75 = 100 : \frac{7500}{23} = 326.$$

He must therefore apply 326 lb. to the acre, and to the 1-112th 2.91 lb. For 150 lb. of soluble phosphates per acre he must use therefore 5.82 lb., and should it be thought advisable to try also 225 lb. soluble phosphates per acre he must then use 8.73 lb. on his plots. As in some instances phosphates applied alone produce but little effect, the same quantities should be used with the addition of sulphate of ammonia, for which purpose that manure should be employed to the extent of 1 cwt. per acre or 1 lb. per plot, and a plot should be manured with 1 lb. of sulphate of ammonia without any other manure. All the experiments should be made in duplicate, and they would therefore stand as follows:—

2 Plots $\frac{1}{112}$ acre each	manured at the rate of	75 lb.	soluble	phosphates per acre	
2	,,	,,	150	,,	,,
2	,,	,,	225	,,	,,
2	,,	,,	nothing		
2	,,	,,	75	,,	112 lb. sulphate
2	,,	,,	150	,,	112 of ammonia
2	,,	,,	225	,,	112 ,,
2	,,	,,	...		112 ,,
2	,,	,,	nothing		

If the experimenter resolves to use also double quantities of sulphate of ammonia, this would require eight additional plots, or in all a quarter of an acre. Any one objecting to these small plots has only to multiply the quantities by 2, 4, or 8, and his results would be perfectly comparable with those of others. It is very desirable that these inquiries should be made simultaneously by several observers in different parts of the country and on different soils, and I shall be glad to be the medium of putting experimenters into communication with one another, and to make the necessary calculation of quantities should any difficulty be experienced in doing it.

Interesting and useful experiments might also be made for the purpose of determining the value of insoluble phosphates in different forms. Bones, as every one knows, act rapidly and effectually as a manure, while coprolites, though containing the same insoluble phosphates, are usually understood to be without action. The difference is of course attributed to the mineral character of the latter, and to their hard and compact structure rendering them, even when finely ground, inaccessible to plants. It appears, however, that if bones be simply burned, the bone-ash, containing all the phosphates in their original mechanical condition, is quite inert. Such at least is the conclusion to be drawn from the few experiments with bone-ash on record; but

they are so few that they require to be confirmed, and the cause of this peculiarity ascertained. The practical importance of the subject lies in the fact that, at the present moment, it is universally admitted that the insoluble phosphates of a superphosphate made from coprolites are of no value; but those in a bone-ash superphosphate have been usually considered to be as valuable as if they were derived from the unburned bones. If it should be established that in neither case are insoluble phosphates of value, the result would be of importance, because it would make a material difference in the value of all superphosphates made from bone-ash. Even when the quantity of insoluble phosphates is no more than 5 per cent, their non-estimation would make a difference of at least 7s. per ton in the price of the manure.

To elucidate this point let it be resolved to use coprolites and bone-ash at such a rate as to supply 300 lb. phosphates per acre, and also double this quantity. Then making duplicate experiments, four plots of coprolites and four of bone-ash would be required, and two nothing plots, for the simplest form of the experiment. But it would be useful also to contrast the results with those obtained when sulphate of ammonia is added, for which purpose 1 cwt. of that manure per acre might be used, taking care of course that two plots are taken for it without phosphates. The experiment should be made on 1-112th of an acre, or a multiple of that quantity, and the necessary details may be gathered from what has been said under the preceding section.

B.—Experiments on the action of organic matters containing nitrogen.

In bones part of the effect produced is due to the nitrogenous organic matters they contain. It is sometimes supposed that these substances are valuable only on account of the nitrogen which they supply; but this can scarcely be correct, for I apprehend that a mixture of ground bone-ash and sulphate of ammonia would not act so powerfully as bones containing the same quantities of these substances. This subject might easily be investigated in connection with the experiments A in the previous section, or as an independent series by taking bones at the rate of 5 cwt. per acre, and comparing them with mixtures of bone-ash and sulphate of ammonia, bone-ash and glue, and bone-ash and rape-dust. 5 cwt. of bones would contain about 250 lb. of phosphates and 25 of ammonia, and if these were made the standards, the requisite quantities of bone-ash, glue, and rape-dust might be easily calculated from their analyses.

C.—Experiments with the salts of potash.

A series of experiments on this subject is much required. Some

years since, when discussing the alleged exhaustion of the soil of the British Islands by the modern system of agriculture, I expressed the opinion that, so long as the present supplies existed, there was no probability of the ammonia or phosphates being exhausted, but that a diminution in the available supplies of potash was a possibility, though a distant one. Up to the present time we have very little information regarding the manurial effects of potash, and what has been obtained is conflicting. A few years ago, experiments were made, at my instigation, with muriate of potash on the potato, a crop requiring a large amount of that alkali, and the results were very favourable, and in one case so remarkable that the gentleman who made the experiments procured a supply, and used it on a considerable scale in the subsequent year, but the results were then entirely negative.

The cause of this remarkable difference, and indeed everything relating to the manurial action of potash, is still to learn; and the subject merits attention at the present time. Up to within the last two or three years, kelp was the chief source of the cheaper salts of potash (the muriate and sulphate, which alone are ever likely to be used as manures), and in consequence of the limited supply, and the demand for potash salts, their price was constantly on the increase. A few years since, however, the manufacture of muriate of potash from carnallite, a mineral found in the salt-mines at Stasfurth, in Germany, was commenced, and the price has in consequence materially declined, and will probably fall still further, especially if the same mineral should be discovered in other salt-mines, of which there seems every probability, for it has been found in Cheshire in small fragments, though not in quantity. At the present moment, muriate of potash, containing potassium equivalent to about 50 per cent of potash, can be bought for about £14, 10s. per ton.

Experiments might be usefully made by applying 50 and 100 lb. of potash per acre, both alone and mixed with guano and superphosphate. The following quantities would be suitable:—

2 plots with muriate of potash, at the rate of 50 lb. potash per acre;
2 plots the same, with bone-ash superphosphate, at the rate of 75 lb. soluble phosphate;
2 plots the same, but with Bolivian guano containing phosphates at the rate of 75 lb. per acre;
2 plots the same, but with superphosphate as before, and sulphate of ammonia, at the rate of 1 cwt. per acre.

Such experiments would not by any means exhaust the subject, but the results obtained would form a guide for further inquiries in future seasons; and it would be better to proceed in this way than to attempt more elaborate inquiries at present.

Many other subjects for inquiry might be suggested, such, for example, as the effect of salts of magnesia, which are sometimes used

as manures for the cereals, under the impression that they must be useful, because the ash of these plants contains a large quantity of magnesia. But I refrain from enlarging on these at present. I shall, however, take another opportunity of suggesting other subjects for investigation, and I shall be glad if any gentleman proposing to engage in experiments, will communicate with me; for when two or more individuals consider the same subject, especially if they do so from different points of view, useful suggestions are frequently made.

As I have not discussed the subject of cattle experiments, I shall not enlarge on them here, but would simply remark that we are still greatly in want of a complete and exhaustive series of experiments on the relative nutritive value of Swedes and common turnips. The effect of water in promoting the fattening of stock also merits inquiry. It has been recently observed by a French experimenter, that when a horse was liberally supplied with water it gained weight rapidly, even when its daily rations of solid food were materially diminished. Should this be confirmed by further experiment, and found to be applicable to cattle and sheep, it would obviously be a matter of great importance to the farmer.

3d.—*The mode in which experimental agriculture can be best promoted.*

It remains only to consider what may be done to promote the pursuit of experiment; and here it may perhaps be thought that the description of all that is necessary for a perfect experiment, and the numerous precautions it requires, may have rather the effect of deterring those who might otherwise wish to engage in it—and it must be admitted that good experiments do require both time and patience; but it is by no means so difficult to secure accuracy, and to attend to all these precautions, as it may appear. Any one inclined to take up experiment will find that, as in everything else, the hand gets used to it, and that which at first occasions a good deal of trouble becomes much simpler, and can with experience be accomplished without the effort it requires at the outset. Neither should he be deterred from the good work by being in a position in which he cannot carry out all the details already insisted on, for he may rest assured that experiments in which some of the precautions are omitted, may still be useful, although necessarily not so valuable as those in which they are observed.

This much, however, may be said, that whenever the choice lies between many experiments with few precautions, and few experiments with many precautions, the latter alternative should unhesitatingly be adopted. The true plan is to undertake no more than can be well and effectually accomplished, and where a variety of

results is required, it is best that several individuals should associate themselves together for the purpose. Where this is done the results are sure to be most valuable, particularly where the same experiments are repeated on different soils and districts for several successive years, so as to elucidate the effect of disturbing causes. But when several persons unite for this purpose, it should be made a strict regulation that the experiments should be made exactly in the same manner, and that no one should be allowed to modify any of the details. Many instances could be quoted in which the value of experiments were materially diminished in this way.

The principle of association to which reference has just been made, is one of great importance to the future of experimental agriculture, and is one of the methods by which it may be most successfully promoted. As our knowledge advances experiments must of necessity become more and more complex and elaborate, and at length require an expenditure of both time and money which at no distant date will put it beyond the power of individuals to make them. The elaborate researches of Messrs Lawes and Gilbert, which are unsurpassed for minuteness and precision, may be referred to as an example of what agricultural experiments ought to be, and of the difficulty of increasing their number, for I need scarcely say that the case is quite exceptional in which an individual has both the will and the power to expend nearly £2000 a year for many successive years in inquiries of this kind.

It might be accomplished, however, if the means requisite for the purpose were raised by subscription, and this plan has been adopted by the German agriculturists, whose exertions well merit attention. There have been established for some years back in that country what are called Agricultural Experiment Stations, of which the number is considerable, I believe not less than eight or ten being in existence, supported chiefly by subscriptions, to which the Government in some instances contributes, their entire object being to carry out inquiries in various departments of agriculture. They differ considerably in extent, and the particular departments of experiment they prosecute, but, as an example, I may instance that at Salzmunde, in Saxony, which is under the direction of Dr Grouven, an able chemist, and author of a course of lectures on Agricultural Chemistry. It includes a laboratory, small cattle house for feeding experiments, and other necessary appliances. The cost of starting the station was between £400 and £500, and the annual expenditure about £450, but this does not include any charge for land, manure, labour, or cattle food consumed in the experiments, all of which were supplied by a neighbouring proprietor free of all expense. The other Experimental Stations throughout the country were conducted on a similar plan, though, in some instances, the means are smaller, in which case, of course, the experiments are more limited. Dr

Grouven, who appears to have given much attention to the subject, is of opinion that the minimum outlay should not be less than it is at Salzmunde.

The cost of a similar institution in this country, taking into account the much greater expense of living, and the wages, would not be less than double what it is in Germany, or say £1000 a-year; to this must be added the cost of land, labour, &c., which I have no means of estimating, but it could not be well under £200 or £300 a-year, so that the expense of an Experimental Station in this country would not be less than £1200 a-year. As there are eight or ten stations in Germany, the agriculturists of that country are at the present moment expending a sum equivalent to £8000 or £10,000 a-year of our money for the encouragement of scientific agriculture.

The Experimental Stations are doing a great deal of good work, and support a periodical, in which the results of their labours are given to the public. They offer an example which might be advantageously followed in this country, and though it may be vain to expect, at least at present, an outlay at all equivalent to that which is made in Germany, something might surely be done. If an institution of this kind could be established in Scotland I should myself be glad to contribute towards it both money and labour, and I am satisfied that if it were properly started its results would, in the course of time, be in the highest degree beneficial to agriculture.

STIRLING SHOW, 1st, 2d, 3d, and 4th August 1864.

AWARD OF PREMIUMS.

Class I.—CATTLE.

SHORTHORN BREED.

Judges—George A. Grey, Millfield Hill, Wooler; James Gulland, Newton of Wemyss, Kirkcaldy; Thomas Simson, Blainslie, Lauder.

Attending Member—H. D. Erskine of Cardross, Stirling.

The Medium Gold Medal was awarded to each of the following Exhibitors:—

Amos Cruickshank, Sittyton, Aberdeen, for Bull, "Forth," winner of First Prize at Kelso, 1863.

Lord Kinnaird, K.T., Rossie Priory, Inchture, for Bull, "Cherry Duke 2d," winner of First Prize at Edinburgh, 1859.

James Douglas, Athelstaneford, Drem, for Cow, "Lady of Athelstane," winner of First Prize at Dumfries, 1860.

Section

1. Best Bull calved before 1st January 1862—L.20 to G. H. M. Binning Home of Argaty, Doune. Second—L.10 to Viscount Strathallan, Strathallan Castle, Auchterarder. Third—The bronze medal to David Ain-

slie of Costerton, Blackshiels. Commended—Silvester Campbell, Kinellar, Blackburn, Aberdeen. The silver medal to G. H. M. Binning Home of Argaty, Doune, as the *Breeder* of the best Bull.

2. Best Bull calved after 1st January 1862—L.20 to James Douglas, Athelstaneford, Drem. Second—L.10 to Thomas Willis, Manor House, Carperby, Bedale, Yorkshire. Third—The bronze medal to Lord Kinnaird, K.T., Rossie Priory, Inchture. Commended—William Marr, Upper Mill, Tárves, Aberdeenshire.
3. Best Bull calved after 1st January 1863—L.10 to the Duke of Buccleuch and Queensberry, K.G., Dalkeith Park, Dalkeith. Second—L.5 to Arthur James Balfour of Whittingham, Prestonkirk. Third—The bronze medal to Viscount Strathallan, Strathallan Castle, Auchterarder. Commended—The Earl of Airlie, K.T., Cortachy Castle, Kirriemuir.
4. Best Cow of any age—L.15 to A. & A. Mitchell, Alloa. Second—L.8 to John Bowstead, Beck Bank, Penrith. Third—The bronze medal to George Robertson Barclay of Keavil, Dunfermline. Commended—James Douglas, Athelstaneford, Drem.
5. Best Heifer calved after 1st January 1862—L.10 to William Lambert, Elrington Hall, Haydon Bridge. Second—L.5 to Jaffray Barcroft, Kilbogget House, Cabinteely, County Dublin. Third—The bronze medal to Arthur James Balfour of Whittingham, Prestonkirk. Commended—Viscount Strathallan, Strathallan Castle, Auchterarder.
6. Best Heifer calved after 1st January 1863—L.8 to A. & A. Mitchell, Alloa. Second—L.4 to A. & A. Mitchell, Alloa. Third—The bronze medal to James Douglas, Athelstaneford, Drem. Commended—David Ainslie of Costerton, Blackshiels.

POLLED (ABERDEEN OR ANGUS).

Judges—ALEXANDER BOWIE, Mains of Kelly, Arbroath; GEORGE BROWN, Westerton, Fochabers; JAMES SHENNAN, Balig, Kirkcudbright.

Attending Member—HUGH KIRKWOOD, Killermont, Maryhill, Glasgow.

The Medium Gold Medal was awarded to each of the following Exhibitors:—

Robert Walker, Hillside House, Portlethen, Aberdeen, for Bull, "Fox Maule," winner of First Prize at Kelso, 1863.

William M'Combie, Tillyfour, Aberdeen, for Cow, "Fair Maid of Perth," winner of First Prize at Edinburgh, 1859, and medium gold medal at Perth, 1861.

William M'Combie, Tillyfour, Aberdeen, for Cow, "Charlotte," winner of First Prize at Inverness, 1856.

William M'Combie, Tillyfour, Aberdeen, for Cow, "The Belle," winner of First Prize at Aberdeen, 1858.

William M'Combie, Tillyfour, Aberdeen, for Cow, "Pride of Aberdeen," winner of First Prize at Dumfries, 1860, and Battersea, 1862.

William M'Combie, Tillyfour, Aberdeen, for Cow, "Mayflower," winner of First Prize at Perth, 1861.

7. Best Bull calved before 1st January 1862—L.20 to Alexander Paterson, Mulben, Keith. Second—L.10 to Sir James H. Burnett of Leys, Bart., Crathes Castle, Aberdeen. Third—The bronze medal to John Hepburn, Dogton, Kirkcaldy. The silver medal to George Brown, Westerton, Fochabers, as the *Breeder* of the best Bull.
8. Best Bull calved after 1st January 1862—L.20 to William Goodlet, Bolshan, Arbroath. Second—L.10 to Robert Walker, Hillside House, Portlethen, Aberdeen. Third—The bronze medal to Robert Walker, Montbletton, Banff.
9. Best Bull calved after 1st January 1863—L.10 to James Leslie, The Thorn, Blairgowrie. Second—L.5 to James Leslie, The Thorn, Blairgowrie Third—The bronze medal to William M'Combie, Tillyfour, Aberdeen

10. Best Cow of any age—L.15 to William M'Combie, Tillyfour, Aberdeen. Second—L.8 to William M'Combie, Tillyfour, Aberdeen. Third—The bronze medal to William M'Combie, Tillyfour, Aberdeen. Commended—Robert Walker, Hillside House, Portlethen, Aberdeen.
11. Best Heifer calved after 1st January 1862—L.10 to Robert Walker, Montbletton, Banff. Second—L.5 to the Earl of Southesk, Kinnaird Castle, Brechin. Third—The bronze medal to the Earl of Southesk, Kinnaird Castle, Brechin.
12. Best Heifer calved after 1st January 1863—L.8 to William M'Combie, Tillyfour, Aberdeen. Second—L.4 to William M'Combie, Tillyfour, Aberdeen. Third—The bronze medal to Lord Kinnaird, K.T., Rossie Priory, Inchture.

POLLED (GALLOWAY).

Judges—ALEXANDER BOWIE, Mains of Kelly, Arbroath; GEORGE BROWN, Westerton, Fochabers; JAMES SHENNAN, Balig, Kirkcudbright.

Attending Member—HUGH KIRKWOOD, Killermont, Maryhill, Glasgow.

The Medium Gold Medal to James Graham, Meikle Culloch, Dalbeattie, for Cow, "Semiramis," winner of First Prize at Kelso, 1863.

13. Best Bull calved before 1st January 1862—L.20 to Samuel Thomson, Blaiket, Crocketford, Dumfries. Second—L.10 to William Keir of Whithaugh, New Castleton. Third—The bronze medal to Alexander Jardine of Applegirth, Lockerby. The silver medal to W. & J. Shennan, Balig, Kirkcudbright, as the *Breeders* of the best Bull.
14. Best Bull calved after 1st January 1862—L.20 to William and Robert Callander, Dalquhairn, Dumfries. Second—L.10—*No Entry.*
15. Best Bull calved after 1st January 1863—L.10 to John Cunningham, Whitecairn, Dalbeattie. Second—L.5—*No Competition.*
16. Best Cow of any age—L.15 to the Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill. Second—L.8 to James Graham, Meikle Culloch, Dalbeattie. Third—The bronze medal to John Cunningham, Whitecairn, Dalbeattie.
17. Best Heifer calved after 1st January 1862—L.10 to Wellwood Maxwell of Glenlee, New Galloway. Second—L.5 to James Graham, Meikle Culloch, Dalbeattie. Third—The bronze medal to Robert Jardine, Balgray, Lockerby.
18. Best Heifer calved after 1st January 1863—L.8 to James Cunningham, Tarbreoch, Dalbeattie. Second—L.4 to Wellwood Maxwell of Glenlee, New Galloway. Third—The bronze medal to Wellwood Maxwell of Glenlee, New Galloway.

AYRSHIRE.

Judges—ALEXANDER BUCHANAN, Garscadden Mains, New Kilpatrick; JOHN HYSLOP, Bank House, Kilmarnock; ROBERT MUIRHEAD, Chester Hall, Wiston, Biggar.

Attending Member—Sir ALEX. C. GIBSON MAITLAND of Clifton Hall, Bart.

The Medium Gold Medal was awarded to :—

The Duchess Dowager of Athole, Dunkeld, for Cow, "Collyhill," winner of First Prize at Edinburgh, 1859, and medium gold medal at Kelso, 1863.

The Duchess Dowager of Athole, Dunkeld, for Cow, "Premium," winner of First Prize at Glasgow, 1857, and medium gold medal at Kelso, 1863.

19. Best Bull calved before 1st January 1862—L.20 to John Stewart, Burnside Cottage, Strathaven. Second—L.10 to the Duchess Dowager of Athole, Dunkeld. Third—The bronze medal to W. A. M'Lachlan, Auchintroig, Balfron. Commended—John Inglis, Spittalton, Gar-

gunnock. The silver medal to William Craig, Craig Villa, New Cumnock, as the *Breeder* of the best Bull.

20. Best Bull calved after 1st January 1862—L.20 to Archibald Bulloch, Milliken, East Kilpatrick. Second—L.10 to John Brown, Kirkmuir, Stewarton. Third—The bronze medal to John Stewart, Burnside Cottage, Strathaven. Commended—Miss Hope Johnstone of Annandale, Marchbank Wood, Moffat.

21. Best Bull calved after 1st January 1863—L.10 to John Parker, Broomlands, Irvine. Second—L.5 to James Kay, Hill Farm, Gargunnock. Third—The bronze medal to James Frew, Balmalloch, Kilsyth. Commended—John Stewart, Burnside Cottage, Strathaven.

22. Best Cow in milk, of any age—L.10 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Second—L.5 to Robert Wilson, Nether Johnstone, Kilbarchan. Third—The bronze medal to the Duchess Dowager of Athole, Dunkeld. Commended—The Duke of Hamilton and Brandon, Hamilton Palace, Hamilton.

23. Best Cow in Calf, of any age—L.10 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Second—L.5 to the Earl of Strathmore, Glamis Castle, Glamis. Third—The bronze medal to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Commended—The Duchess Dowager of Athole, Dunkeld.

24. Best Heifer calved after 1st January 1862—L.10 to Sir Graham G. Montgomery of Stanhope, Bart., M.P., Stobo Castle, Peebles. Second—L.5 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Third—The bronze medal to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Commended—Sir Graham G. Montgomery of Stanhope, Bart., M.P., Stobo Castle, Peebles.

25. Best Heifer calved after 1st January 1863—L.8 to John Parker, Broomlands, Irvine. Second—L.4 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Third—The bronze medal to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Commended—The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill.

HIGHLAND.

Judges—John Macfarlan, Faslane, Helensburgh; John S. Menzies of Chesthill, Aberfeldy.

Attending Member—H. Fletcher Campbell of Boquhan, Stirling.

The Medium Gold Medal was awarded to each of the following Exhibitors:—

John Malcolm of Poltalloch, Lochgilphead, for Bull, "Duntroon," winner of First Prize at Perth, 1861, and Battersea, 1862.

The Duke of Athole, Blair Castle, Blair-Athole, for Cow, "Rosie," winner of First Prize at Kelso, 1863.

Donald M'Laren, Corrychrone, Callander, for Cow, winner of First Prize at Perth, 1861.

John Malcolm of Poltalloch, Lochgilphead, for Cow, "Shuna," winner of First Prize at Battersea, 1862.

26. Best Bull calved before 1st January 1861—L.20 to James Gordon of Manar, Keith Hall. Second—L.10 to Duncan Stewart, Monachill, Lochearnhead. Third—The bronze medal to Archibald Stewart, Claigan, Dunvegan, Isle of Skye. Commended—John Stewart, Bochastle, Callander.

27. Best Bull calved after 1st January 1861—L.20 to the Duke of Athole, Blair Castle, Blair-Athole. Second—L.10 to Alexander M'Donald, Ballachallan, Callander. Third—The bronze medal to George Campbell, Ardifuir, Lochgilphead.

28. Best Bull calved after 1st January 1862—L.10 to Robert Lawrie, Fincharn, Ford, Lochawside. Second—L.5 to Mrs Ewing, Strathleven House, Dumbarton. Third—The bronze medal to Allan Pollok, Ronachan, Clachan, Cantyre. Commended—Alexander Macdonald, Nether Largie, Lochgilphead.
29. Best Cow of any age—L.10 to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Second—L.5 to the Duke of Athole, Blair Castle, Blair-Athole. Third—The bronze medal to Donald M'Laren, Corrychrone, Callander. Commended—John Malcolm of Poltalloch, Callton Mor, Lochgilphead.
30. Best Heifer calved after 1st January 1861—L.10 to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Second—L.5 to the Duke of Athole, Blair Castle, Blair-Athole. Third—The bronze medal to the Duke of Athole, Blair Castle, Blair-Athole. Commended—The Duke of Athole, Blair Castle, Blair-Athole.
31. Best Heifer calved after 1st January 1862—L.8 to Allan Pollok, Ronachan, Clachan, Cantyre. Second—L.4 to Allan Pollok, Ronachan, Clachan, Cantyre. Third—The bronze medal to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Commended—John Malcolm of Poltalloch, Callton Mor, Lochgilphead.

FAT STOCK.

Judges—ROBERT HARDIE, Harrietfield, Kelso; GEORGE PRENTICE of Strathore, Kirkcaldy.

Attending Member—JAMES JOHNSTONE of Alva, Stirling.

32. Best Ox, of any Pure or Cross breed, calved after 1st January 1861—The medium gold medal to William Scott, Timpendean, Jedburgh. Second—The silver medal to J. & W. Martin, Aberdeen. Third—The bronze medal to A. & A. Mitchell, Alloa.
33. Best Ox, of any Pure or Cross breed, calved after 1st January 1862—The medium gold medal to William Scott, Timpendean, Jedburgh. Second—The silver medal to Bryce Wright, Dowhill, Girvan. Third—The bronze medal to J. & W. Martin, Aberdeen.
34. Best Ox, of any Pure or Cross breed, calved after 1st January 1863—The medium gold medal to Sir A. P. Gordon Cumming of Altyre, Bart., Forres. Second—The silver medal to Sir A. P. Gordon Cumming of Altyre, Bart., Forres. Third—The bronze medal to Sir A. P. Gordon Cumming of Altyre, Bart., Forres.
35. Best Highland Ox calved after 1st January 1860—The medium gold medal to the Duke of Athole, Blair Castle, Blair-Athole. Second—The silver medal to Sir A. P. Gordon Cumming of Altyre, Bart., Forres. Third—The bronze medal to the Duke of Sutherland, Dunrobin Castle, Golspie. Commended—J. & W. Martin, Aberdeen.
36. Best Highland Ox, calved after 1st January 1861—The medium gold medal to James Gordon of Manar, Keith Hall. Second—The silver medal to Henry Home Drummond of Blairdrummond, Stirling. Third—The bronze medal to John Stirling of Kippendavie, Kippenross, Dunblane.
37. Best Cross Heifer calved after 1st January 1862—The medium gold medal to Bryce Wright, Dowhill, Girvan. Second—The silver medal to James Stewart, 29 Union Street, Aberdeen. Third—The bronze medal to James Stewart, Aberdeen. Commended—James Stewart, Aberdeen.
38. Best Cross Heifer calved after 1st January 1863—The medium gold medal to David Wallace, Balgrummo, Leven. Second—The silver medal to James Robertson, Denbrae, Cupar-Fife. Third—The bronze medal to Robert Husband, Gellet, Dunfermline.

EXTRA CATTLE.

The Judges commended—Highland Cow, with calf at foot, belonging to G. H. M. Binning Home of Argaty, Doune; Two Highland Heifers (Free Martins) age 6 years and 6 months, belonging to John Lorn Stewart of Coll, Stronvar House, Campbeltown; Brittany Bull, age 3 years and 2 months, belonging to James Erskine Paterson, Linlathen, Broughty Ferry.

Class II.—HORSES

FOR AGRICULTURAL PURPOSES.

Judges—John Curror, Comiston, Colinton, Edinburgh; Robert Findlay, Springhill, Baillieston, Glasgow; William Lang, Blairdirdie, Duntocher.

Attending Member—William Forbes of Callendar, Falkirk.

The Medium Gold Medal to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton, for Stallion, "Sir Walter Scott," winner of First Prize at Dumfries, 1860.

The Medium Gold Medal to William Park, Balquhanran, Dalmuir, Glasgow, for Clydesdale Mare, winner of First Prize at Perth, 1861.

Section

1. Best Stallion foaled before 1st January 1861—L.30 to Andrew Logan, Crossflat, Kilbarchan. Second—L.15 to Peter Anderson, Gillespie, Glenluce. Third—The bronze medal to Samuel Clark, Manswrae, Kilbarchan. Commended—William Robertson, Mitchelton, Lochwinnoch. The silver medal to Andrew Logan, Crossflat, Kilbarchan, as the *Breeder* of the best Stallion.
2. Best Entire Colt foaled after 1st January 1861—L.20 to John Kerr, The Bloom, Mid-Calder. Second—L.10 to Robert Murdoch, Hallside, Cambuslang. Third—The bronze medal to Wellwood Maxwell of Glenlee, New Galloway. Commended—Robert Weir, Brownhill, Carnwath.
3. Best Entire Colt foaled after 1st January 1862—L.15 to Peter Anderson, Gillespie, Glenluce. Second—L.8 to George Scott, Barr, Largs. Third—The bronze medal to Robert Morton, Dalmuir, Old Kilpatrick. Commended—Andrew Wilson, Whiteside of Forbes, Aberdeen.
4. Best Entire Colt foaled after 1st January 1863—L.10 to William Kirkwood, Shankston, Patna, Ayr. Second—L.5 to James Kay, Hillfarm, Gargunnock. Third—The bronze medal to Peter Crawford, Dumgoyack, Strathblane. Commended—John Kerr, The Bloom, Mid-Calder.
5. Best Mare (with foal at foot) foaled before 1st January 1861—L.20 to Alexander Buchanan, Garscadden Mains, New Kilpatrick. Second—L.10 to D. R. Williamson of Lawers, Crieff. Third—The bronze medal to James Salmon, Benston, Paisley. Commended—John Watson, jun., Glencairn Cottage, Motherwell.
6. Best Mare (in foal) foaled before 1st January 1861—L.15 to William Stirling of Keir, M.P., Dunblane. Second—L.8 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Third—The bronze medal to Wellwood Maxwell of Glenlee, New Galloway. Commended—Duke of Hamilton and Brandon, Hamilton Palace, Hamilton.
7. Best Filly foaled after 1st January 1861—L.10 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Second—L.5 to William Park, Balquhanran, Dalmuir, Glasgow. Third—The bronze medal to Major John Findlay of Easterhill, Glasgow. Commended—Robert Mowbray, Cambus, Stirling.
8. Best Filly foaled after 1st January 1862—L.8 to the Duke of Hamilton and Brandon, Hamilton Palace, Hamilton. Second—L.4 to James Finlayson, Baker Street, Stirling. Third—The bronze medal to Major

John Findlay of Easterhill, Glasgow. Commended—James Rennie, Allanfauld, Kilsyth.

9. Best Filly foaled after 1st January 1863—L.6 to Wellwood Maxwell of Glenlee, New Galloway. Second—L.3 to Alexander Buchanan, Garscadden Mains, Glasgow. Third—The bronze medal to David M'Gibbon, Inveravon, Polmont. Commended—William Stirling of Keir, M.P., Dunblane.

EXTRA HORSES.

Judges—John Gibson, Woolmet, Dalkeith; James Wilson, Wester Cowden, Dalkeith; James Hope, Duddingstone, Edinburgh.

Attending Member—W. A. Maclachlan of Auchintroig, Balfron.

The Judges commended—Five Geldings and a Mare, belonging to Wordie & Co., Glasgow; Half-bred Mare, belonging to James Cousland, Denny; Highland Pony Stallion, belonging to Donald M'Leod, Riverford, Dingwall; Shetland Pony Gelding, belonging to Campbell Blair, Auchinlay, Dunblane; Pony Gelding, belonging to D. G. Robertson, East Mains, Callander.

CLASS III.—SHEEP.

LEICESTER.

Judges—James Geddes, Orbliston, Fochabers; George Hope, Fenton Barns, Drem; William Torr, Aylesby Manor, Grimsby.

Attending Member—William Henderson, Craigarnhall, Stirling.

Section

1. Best Tup, not above four shear—L.10 to Thomas Simson, Blainslie, Lauder. Second—L.5 to David Ainslie of Costerton, Blackshiels. Third—The bronze medal to Thomas Watson, Esperston, Gorebridge.
2. Best Dinmont or Shearling Tup—L.10 to Thomas Simson, Blainslie, Lauder. Second—L.5 to George Simson, Courthill, Kelso. Third—The bronze medal to George Simson, Courthill, Kelso. Commended—George Torrance, Sisterpath, Dunse.
3. Best Five Ewes, not above four shear—L.8 to William Purves, Burnfoot, Kelso. Second—L.4 to Thomas Ferguson, Kinnochtry, Coupar-Angus.
4. Best Five Shearling Ewes or Gimmers—L.8 to George Simson, Courthill, Kelso. Second—L.4 to Thomas Simson, Blainslie, Lauder. Third—the bronze medal to David Ainslie of Costerton, Blackshiels. Commended—Lord Kinnaird, K.T., Rossie Priory, Inchture.

CHEVIOT.

Judges—Thomas Barclay, Skelbo, Dornoch; John Robson, Byreness, Otterburn, Northumberland.

Attending Member—Sir William C. B. Bruce of Stenhouse, Bart.

5. Best Tup, not above four shear—L.10 to James Brydon, jun., Kinnelhead, Moffat. Second—L.5 to Thomas C. Borthwick, Hopsrig, Langholm. Third—The bronze medal to Sir Graham G. Montgomery of Stanhope, Bart., M.P., Stobo Castle, Peebles. Commended—Thomas Elliot, Hindhope, Jedburgh.
6. Best Dinmont or Shearling Tup—L.10 to James Brydon, Moodlaw, Langholm. Second—L.5 to Thomas Elliot, Hindhope, Jedburgh. Third—The bronze medal to Thomas Elliot, Hindhope, Jedburgh. Commended—William G. Hunter, Dumfedling, Langholm.
7. Best Five Ewes not above four shear, with lambs at foot—L.8 to Thomas C. Borthwick, Hopsrig, Langholm. Second—L.4 to James Brydon,

jun., Kinnelhead, Moffat. Third—William G. Hunter, Dumfedling, Langholm.

Best Pen of Lambs—the silver medal to James Brydon, jun., Kinnelhead, Moffat. Commended—Sir Graham G. Montgomery of Stanhope, Bart., M.P., Stobo Castle, Peebles.

8. Best Five Shearling Ewes or Gimmers—L.8 to Robert Shortreed, Attonburn, Kelso. Second—L.4 to Thomas Elliot, Hindhope, Jedburgh. Third—The bronze medal to James Brydon, Moodlaw, Langholm.

BLACKFACED.

Judges—Captain Kennedy of Bennane, Glen App, Girvan; John Lorn Stewart of Coll, Campbeltown; Duncan Mitchell, Blairvockie, Luss.

Attending Member—Archd. Orr Ewing of Ballikinrain, Killearn.

9. Best Tup, not above four shear—L.10 to Thomas Murray, Eastside, Penicuik. Second—L.5 to Thomas Murray, Eastside, Penicuik. Third—The bronze medal to David Foyer, Knowehead, Campsie. Commended—Donald M'Laren, Corrychrone, Callander.

10. Best Dinmont or Shearling Tup—L.10 to Thomas Aitken, Listonshiels, Balerno. Second—L.5 to the Heirs of the late James Watson, Nisbet, Biggar. Third—The bronze medal to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Commended—Robert Elliot, Laighwood, Dunkeld.

11. Best Five Ewes, not above four shear, with lambs at foot—L.8 to John Phillips, Laighpark, Milngavie. Second—L.4 to Donald M'Laren, Corrychrone, Callander. Third—The bronze medal to Thomas Murray, Eastside, Penicuik. Commended — Allan Pollok, Ronachan, Clachan, Cantyre.

12. Best Five Shearling Ewes or Gimmers—L.8 to John Archibald, Overshiels, Stow. Second—L.4 to John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Third—The bronze medal to John Wilson, Crosshouse, Roslin. Commended—James Allan, Clauchan, Brodick, Arran.

SOUTHDOWN.

Judges—William Goodlet, Bolshan, Arbroath; Charles Smith, Whittingham, Haddington.

Attending Member—Alexander Young, Keir Mains, Dunblane.

13. Best Tup, not above four shear—L.10 to Robert Scot Skirving, Camptoun, Drem. Second—L.5 to David R. Williamson of Lawers, Crieff. Third—The bronze medal—*No Entry.*

14. Best Dinmont or Shearling Tup—L.10 to Robert Scot Skirving, Camptoun, Drem. Second—L.5 to Robert Scot Skirving, Camptoun, Drem. Third—The bronze medal to James Bruce, Burnside, Fochabers.

15. Best Five Ewes, not above four shear—L.8 to Robert Scot Skirving, Camptoun, Drem. Second—L.4 to Alexander S. Finlay of Castle Toward, M.P., Greenock. Third—The bronze medal—*No Competition.*

16. Best Five Shearling Ewes or Gimmers—L.8 to Robert Scot Skirving, Camptoun, Drem. Second—L.4 to Robert Scot Skirving, Camptoun, Drem. Third—The bronze medal to James Bruce, Burnside, Fochabers. Commended—James Bruce, Burnside, Fochabers.

LONG-WOOLLED OTHER THAN LEICESTER.

Judges—The same as those for Leicesters.

17. Best Tup, not above four shear—L.10 to Thomas Beale Browne, Salperton Park, Andoversford, Gloucestershire. Second—L.5 to Thomas Beale Browne, Salperton Park, Andoversford, Gloucestershire. Third—The

bronze medal to John Gibson, Woolmet, Dalkeith. Commended—The Earl of Wemyss and March, Gosford, Longniddry.

18. Best Five Gimmers, or Ewes not above four shear—L.8 to Thomas Beale Browne, Salperton Park, Andoversford, Gloucestershire. Second—L.4 to John Gibson, Woolmet, Dalkeith. Third—The bronze medal to Robert Scot Skirving, Camptoun, Drem. Commended—Walter Reid, Drem.

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

Judges—The same as those for Southdowns.

19. Best Tup, not above four shear—L.10 to Charles W. Hamilton, Hamwood, Dunboyne, Ireland. Second—L.5 to Charles W. Hamilton, Hamwood, Dunboyne, Ireland. Third—The bronze medal to John Gibson, Woolmet, Dalkeith.
20. Best Five Gimmers, or Ewes not above four shear—L.8 to Charles W. Hamilton, Hamwood, Dunboyne, Ireland. Second—L.4 to John Gibson, Woolmet, Dalkeith. Third—The bronze medal—*No Award.*

EXTRA SHEEP.

The Judges commended—Eight Blackfaced Wethers, belonging to William Guild, Glenquey, Muckhart; Two Gimmers—cross between Lonk and Blackfaced, belonging to J. B. Hamilton of Leny, Callander.

CLASS IV.—SWINE.

Judges—JOHN GIBSON, Woolmet, Dalkeith; JAMES HOPE, Duddingstone, Edinburgh; JAMES WILSON, Wester Cowden, Dalkeith.

Attending Member—JOHN LOCKHART, Dunmore, Stirling.

Section

1. Best Boar, large breed—L.8 to Mrs Fergusson Blair of Balthayock, Inchmartine House, Inchture. Second—L.4 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Third—The bronze medal to W. B. Wainman, Carhead, Crosshills, Yorkshire.
2. Best Boar, small breed—L.8 to Thomas D. Findlay, Easterhill, Glasgow. Second—L.4 to John Laing, Glendeuglie, Kinross. Third—The bronze medal to Robert Philp, Royal Hotel, Bridge of Allan.
3. Best Sow, large breed—L.6 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Second—L.3 to Richard Dickin, Old Road, Stockport. Third—The bronze medal to Thomas D. Findlay, Easterhill, Glasgow.
4. Best Sow, small breed—L.6 to Thomas D. Findlay, Easterhill, Glasgow. Second—L.3 to Thomas Sadler, Norton Mains, Ratho. Third—The bronze medal to Robert Philp, Royal Hotel, Bridge of Allan. Commended—W. B. Wainman, Carhead, Crosshills, Yorkshire.
5. Best Pen of Three Pigs, not exceeding eight months old, large breed—L.4 to W. B. Wainman, Carhead, Crosshills, Yorkshire. Second—L.2 to Thomas D. Findlay, Easterhill, Glasgow. Third—The bronze medal to James Kay, Hill Farm, Gargunnock.
6. Best Pen of Three Pigs, not exceeding eight months old, small breed—L.4 to Robert Philp, Royal Hotel, Bridge of Allan. Second—L.2 to Robert Philp, Royal Hotel, Bridge of Allan. Third—The bronze medal to the Earl of Wemyss and March, Gosford, Longniddry.

EXTRA SWINE.

The Judges commended—Three Boar and three Sow Pigs, belonging to James Gordon of Manar, Keith Hall.

CLASS V.—POULTRY.

Judges—JOHN GIBSON, Woolmet, Dalkeith; JAMES WILSON, Wester Cowden, Dalkeith.

Attending Member—JOHN LOCKHART, Dunmore, Stirling.

Section

1. Best Coloured Dorking Cock and Two Hens—The silver medal to John Curror, Comiston, Colinton, Edinburgh. Second—The bronze medal to Sir John Don Wauchope of Edmonstone, Bart., Musselburgh.
2. Best Coloured Dorking Cockerel and Two Pullets—The silver medal to Mrs Fergusson Blair of Balthayock, Inchmartine House, Inchture. Second—The bronze medal to Sir John Don Wauchope of Edmonstone, Bart., Musselburgh.
3. Best White Dorking Cock and Two Hens—The silver medal to David R. Williamson of Lawers, Crieff. Second—The bronze medal to David R. Williamson of Lawers, Crieff.
4. Best White Dorking Cockerel and Two Pullets—The silver medal—*No Entry.*
5. Best Coloured Cochin-China Cock and Two Hens—The silver medal to Mrs Fergusson Blair, Inchmartine House, Inchture. Second—The bronze medal to Mrs Fergusson Blair, Inchmartine House, Inchture.
6. Best Cochin-China Cockerel and Two Pullets—The silver medal to Mrs Fergusson Blair, Inchmartine House, Inchture. Second—The bronze medal—*No Entry.*
7. Best White Cochin-China Cock and Two Hens—The silver medal to Mrs Fergusson Blair, Inchmartine House, Inchture. Second—The bronze medal to Mrs Fergusson Blair, Inchmartine House, Inchture.
8. Best White Cochin-China Cockerel and Two Pullets—*No Entry.*
9. Best Bramahpootra Cock and Two Hens—The silver medal to Mrs Fergusson Blair, Inchmartine House, Inchture. Second—The bronze medal to Leonard Baker, Park Place, Stirling.
10. Best Bramahpootra Cockerel and Two Pullets—The silver medal to Mrs Fergusson Blair, Inchmartine House, Inchture. Second—The bronze medal—*No Competition.*
11. Best Malay Cock and Two Hens—The silver medal—*No Entry.*
12. Best Malay Cockerel and Two Pullets—The silver medal—*No Entry.*
13. Best Spanish Cock and Two Hens—The silver medal to James Cousland, Banker, Denny. Second—The bronze medal to John Kerr, Brocklehirst, Mouswald, Dumfries.
14. Best Spanish Cockerel and Two Pullets—The silver medal—*No Competition.* Second—The bronze medal—*No Entry.*
15. Best Golden Hamburg Cock and Two Hens—The silver medal to William Swanston, Dryhope, Selkirk. Second—The bronze medal to John Green, Cross Arthurlie House, Barrhead.
16. Best Golden Hamburg Cockerel and Two Pullets—The silver medal to E. E. Wallace, 261 George Street, Aberdeen. Second—The bronze medal—*No Competition.*
17. Best Silver Hamburg Cock and Two Hens—The silver medal to David Ballingall, Blairdrummond, Stirling. Second—The bronze medal to Mrs Fergusson Blair, Inchmartine House, Inchture.
18. Best Silver Hamburg Cockerel and Two Pullets—The silver medal to W. H. Wooley, Upper Hermitage, Leith. Second—The bronze medal —*No Entry.*
19. Best Polish Cock and Two Hens—The silver medal to John Elsworth, Campsie Junction, Kirkintilloch. Second—The bronze medal to Mrs Fergusson Blair, Inchmartine House, Inchture.
20. Best Polish Cockerel and Two Pullets—The silver medal—*No Entry.*
21. Best Game Cock and Two Hens—The silver medal to William M. Gil-

mour, Shawburn, Hamilton. Second—The bronze medal to Henry Heys, Springfield House, Barrhead.

22. Best Game Cockerel and Two Pullets—The silver medal to John Green, Cross Arthurlie House, Barrhead. Second—The bronze medal to Mrs Rennet, North Silver Street, Aberdeen.

23. Best Cock and Two Hens, any other breed—The silver medal to William M. Gilmour, Shawburn, Hamilton. Second—The bronze medal to Henry Heys, Springfield House, Barrhead.

24. Best Cockerel and Two Pullets, any other breed—The silver medal—*No Entry.*

25. Best Bantam Cock and Two Hens—The silver medal to William J. Routledge, 219 Gallowgate, Aberdeen. Second—The bronze medal to David Ainslie of Costerton, Blackshiels.

26. Best Bantam Cockerel and Two Pullets—The silver medal to William J. Routledge, 219 Gallowgate, Aberdeen. Second—The bronze medal —*No Competition.*

27. Best Capons, three of any breed—The silver medal—*No Entry.*

28. Best White Aylesbury Drake and Two Ducks—The silver medal to Henry Heys, Springfield House, Barrhead. Second—The bronze medal to John Curror, Comiston, Colinton, Edinburgh.

29. Best Rouen Drake and Two Ducks—The silver medal to Mrs Fergusson Blair, Inchmartine House, Inchture. Second—The bronze medal to Mrs Fergusson Blair, Inchmartine House, Inchture.

30. Best Drake and Two Ducks, any other breed—The silver medal—*No Competition.* Second—The bronze medal—*No Entry.*

31. Best Black Norfolk Turkey Cock and Two Hens—The silver medal—*No Competition.* Second—The bronze medal—*No Entry.*

32. Best Turkey Cock and Two Hens, any other breed—The silver medal to Mrs Fergusson Blair, Inchmartine House, Inchture. Second—The bronze medal—*No Competition.*

33. Best Gander and Two Geese—The silver medal to Mrs Fergusson Blair, Inchmartine House, Inchture. Second—The bronze medal to Henry Heys, Springfield House, Barrhead.

Class VI.—IMPLEMENTS.

Inspecting Committee—John Miller of Leithen, Millfield House, Polmont; James W. Hunter of Thurston, Dunbar; James Stirling, C.E., Edinburgh; Robert Patterson, Land Valuator, Stirling; Alexander Slight, Edinburgh.

The Committee recommended that means be taken to have the following Implements, &c., tried at the proper season, viz.:—

Combined Reaper and Mower, exhibited by Thomas Halliday, Rosehall, Haddington;

Patent Rotating Harrow, exhibited by T. W. Ashby & Co., Stamford;

Revolving Grain Harrows, exhibited by Peter Winton, Thorn Smithy, Falkirk;

Reaping Machine, exhibited by William Gray, Brownrigg, North Berwick;

Plough, exhibited by John Anderson, Monifieth, Dundee;

Plough, with new construction of mould-board, exhibited by George Ponton, Woolston, Linlithgow;

Vitrified Pipes, exhibited by Alexander Wilson & Sons, Lochhead Works, Dunfermline.

RETURNS OF SEED COMPETITIONS held in 1863 and 1864.

Districts.	Seed exhibited in Competition by Growers to whom Silver medals were awarded.		No. of Competitors.	Award.	Competitors to whom Silver Medals were Adjudged.		Produce per Imperial Acre.	Weight per Bushel.	Date of Sowing.	Date of Reaping.	Ground on which the Prize Seed was Grown.		
	Name of Species and Varieties.	Quantity.			Christian Name and Surname.	Estate or Farm, and Post Town.					Altitude.	Exposure.	Nature of Soil.
Ayrshire. Oct. 29, 1863.	Archer's Prolific Wheat, . . .	Qrs. 3	2	1 0 0	Capt. Campbell of Craigie, .	Craigie, Ayr, ...	Qrs. 10 bolls.	Lb. 64	Nov. 26, 1862,	Aug. 28, 1863,	Feet. 200	Open free Exposure	Light sandy loam.
	Tam Findlay Oats, .	2	8	1 0 0	Robert Montgomerie,	Cockhill, Dundonald, .	7	46	Mar. 15, 1863,	Sept. 6, 1863,	60	South	Sandy loam.
	Perennial Ryegrass, .	2 bush.	13	1 0 0	John Drennan, .	Shaklehill, Tarbolton, .	5 bolls.	29	April 15, 1863,	July 20, 1863,	Not known	South	Clay.
Black Isle. March 3, 1864.	Potato Oats, . . .	3	5	1 0 0	Donald M'Kay, .	Kessoch Farm, North Kessoch, ...	7½	48	Mar. 28, 1863,	Aug. 20, 1863,	50	South	Black loam and sandy bottom.
Spey, Avon, and Fiddoch-side. March 1, 1864.	Norfolk Barley, . .	3	3	1 0 0	Dr Alexander Creyk,	Georgetown, Ballindalloch,	6	58¾	April 25, 1863,	Sept. 10, 1863,	480	N.-W.	Light loam with gravelly bottom.
	English Birley Oats,	3	5	1 0 0	Miss Macpherson Grant, .	Aberlour, Craigellachie, .	7	47½	Mar. 30, 1863,	Sept. 12, 1863,	450	S.-E.	Loam with retentive subsoil.
Strathearn. Mar. 10, 1864.	Potato Oats, . . .	3	8	1 0 0	John Whyte, . .	Muirhead, Invermay, Dunning, . . .	4½	45½	April 1, 1863,	First week of Sept.,	160	North	Light soil.

ON THE BREEDING OF HUNTERS AND ROADSTERS.

By Robert Hutchison of Carlowrie, Kirkliston.

[Premium—Medium Gold Medal.]

The breeding of horses is at all times replete with interest, and forms an important department of agricultural economy, concerning not only those who are personally engaged in its pursuit, but the wider circle of the general public, who make almost daily use of the "noble animal," whether for the purposes of pleasure, commerce, or agriculture; while it has also a claim to be regarded almost as a question of national importance, inasmuch as it contributes to the security of our defences by supplying, in proportion to the attention bestowed upon the improvement of the various breeds, a more or less serviceable and efficient class of animals for those two highly requisite branches of the army—the artillery and cavalry.

Although the breeding of horses for agricultural purposes must naturally command the first place in the mind of the farmer, it does not appear, we think, that sufficient attention is paid (particularly in Scotland) to the improvement of the race of hunters and roadsters; or that the breeding of those two important classes of animals receives that amount of encouragement from local and other agricultural societies which its importance deserves. Doubtless, by the now almost universal introduction and rapid extension of the railway system of communication throughout the length and breadth of our country, the necessity for rearing horses for other than agricultural purposes has in a great measure been diminished; the demand (for commercial purposes) for many of the half-breds and harness horses has disappeared; and, indeed, the keeping of them has been discontinued. The old *coaching-horse* has been distanced by his iron-lunged successor; the fox-hunter, instead of riding to the distant "*meet*," as in olden time, on his stout trotting roadster, now travels by the morning train; and the increased extension of the application of steam power to many agricultural purposes, threatens still further to render the attention due to the maintenance of our national *prestige* for horses of all classes of enduring capability a matter of only secondary moment. Let us hope that such a change in regard to the necessity for horses may not tend to indifference in using means for perpetuating the hitherto unequalled superiority of English breeds, and especially that no further deterioration may accrue to those two classes now under notice; but let us believe that first-class animals of these kinds are only now less commonly seen than heretofore, because less generally used.

To preserve and improve any particular breed of animals, due

regard must be had to the judicious selection and union of proper and suitable parents for transmitting, and perpetuating in their offspring, those qualities and points which may be most esteemed. In no class of animals is this more apparent than in the two species of horses which form the subject of this paper.

The opinion is much too prevalent, and, we fear, too currently credited, that any mare is good enough to breed from, and in this belief the farmer frequently retains as a brood mare some animal worn out in constitution; or, it may be, defective in many of those important points which should always characterise one destined for that purpose; and absence of which, *in the dam*, is almost certain to predicate similar defects in her progeny. Much of this is equally true as regards *the sire*, especially in the case of hunting-stock, as we shall afterwards show; and while many, therefore, are disappointed in the realisation of their hopes in respect to their stock, from that cause alone, another considerable drawback in the way of improving the breed of hunters and roadsters, is the popular opinion regarding the uncertainty which so generally attends the efforts of those engaged in the speculation. Many persons, indeed, even of practical sound sense, look upon the general question of breeding horses as so hazardous an undertaking, and the prospects of success attending it, even under judicious management, as so small, that they are not only themselves deterred from entering into it (although in many instances we know they have otherwise all the inclination and opportunity), but they actually promulgate their views with so much assurance and confidence that others are induced to abandon the idea also, and hence breeding the higher classes of horses has become popularly regarded as a subject of the utmost difficulty, risk, and obscurity,—as, in fact, *a losing speculation.*

To such as hold these views we would say, while we frankly admit that there is much truth in the assertion that uncertainty does prevail to a great extent, and that the difficulty of controlling results or predicting events in breeding may be looked upon as almost insuperable, still very much towards the desired end may be attained, and success and pecuniary remuneration rendered more probable by close and attentive observation of the operations of nature, and by comparing and recording past events; and although we cannot without reservation say that study and a careful comparison of our own experience and labours with those of others under similar circumstances, will lead to infallible rules for fixing and defining certain laws and principles by which breeding may in ordinary cases be guided, still by this practice much may be explained and prevented; and such a system of attentively judging antecedents will always lead to an approach to a more lucid comprehension of the causes which operate in producing certain effects. If this were better and more generally attended to, the subject of breeding would be placed upon a much more certain and satisfactory basis, and breeders them-

selves following such a custom would receive material aid in their endeavours to improve the race, by the speculation being rendered less hazardous; and it would soon be apparent, beyond any doubt, that *chance* alone (as many suppose) does not preside, nor form the *only* agent in breeding horses.

In the spirit of these remarks we have ourselves been guided during ten years in breeding (and with considerable success) these very species of animals of which we are now treating; and we have invariably found that although investigation into, and comparison with, former events does not *always* lead to the same results in parallel cases, they yet amply repay the trouble of inquiry; and we have always observed that those who study the subject most closely invariably receive the highest rewards in the enterprise.

In breeding hunters and first-class roadsters, we maintain that to produce animals combining the three essential requisites of perfection for the purposes required, and which we enumerate in what we deem their order of value — viz., *action, power* (comprehending *endurance*), and *conformation*—one of the parents must be thoroughbred; and we recommend that this purity of breeding be on the paternal side. It is further very important to know exactly the lineage of both parents, and to bring together only such animals as combine within themselves individually as far as possible these qualities:—1st, Action and power, which go to produce speed and endurance, on the side of the descent whence the "blood" is derived; and, 2dly, Form and temper, which generally produce a good conformation in conjunction with energy and action, and these qualifications we prefer taking from the maternal side. But it must always be borne in mind that the ancestry of the dam's family must be as good and pure as is consistent with the symptoms of breeding which she in her own figure and appearance generally presents; for, as Earl Spencer has well remarked in regard to breeding, "the influence which each parent exercises on its progeny is in proportion to the purity and antiquity of its family line."

But not only is it necessary that each parent must in his or her own case exhibit such qualifications as we have stated, it is equally requisite to insure the most successful results in regard to their progeny, that their relations *to each other* in conformation, blood, and age shall be assimilative, otherwise a very good sire and a very good dam *per se* will not necessarily produce an equivalently good foal. In fact, the groundwork for the formation of a good horse consists, not so much in the selection of his sire and dam, as in the adaptation of these parents the one to the other; and the more incongruous they happen to be in regard to the three particulars above specified, the less probability is there that their stock will form either hunters or roadsters of the proper stamp, and the greater the chance of the breeder being presented with only a mongrel-looking animal. When we assert that each parent exercises a definite and arbitrary influence

in the formation of the offspring, we do not mean that there is a mere blending of all the qualities of the two; but that in the foal are found developed certain good points of structure and temper generally derived from the dam (although in some cases it may be from the sire), and other qualities, including most commonly breeding or "blood," speed, and endurance, from the sire.

As a rule, we may state that the external conformation and other characteristics of the stronger or more vigorous parent at the time of congress, are reproduced in predominance over the similar points of the other parent in the progeny. Colts, we have frequently observed, take after the mare, and fillies after the sire.

In bone and enduring capability we notice that the dam exercises the greater preponderance *in thoroughbred stock;* and hence, should a very highly bred mare (probably seven-eighths parts) be put to a thoroughbred stallion, there is an almost certainty of her foal in these two particulars following his dam. We have never yet, however, seen any horse in every respect the exact counterpart of his sire, or the photographic reproduction of his dam; and we have rarely known young stock combine *all* the good points of both parents; and we therefore insist the more strongly upon a more general attention to the careful selection of a sire in every case suited to the particular requirements of the mare from which it is intended to breed. Inattention to this very material principle in breeding begets a race of narrow-chested leggy animals, most frequently very defective in their forelegs, and particularly wanting in that style and quality which are so unmistakably evident where a happier union of parents has been observed.

Nor is the transmission of qualities or defects, as the case may be, confined alone to the parents. It goes back even to the grandsire and grand-dam, or sire of the dam; and many properties or vices, dormant for a generation, are sometimes reproduced in the next. This may be styled "breeding back," and only further confirms the great advantage to be derived from giving due regard to lineage, and carefully excluding from the stud either stallion or mare whose ancestors in any degree, not very remote, are known to have possessed damaging faults; for unfortunately what holds true in regard to the reproduction of good points of character or of form, is equally so as regards vices, although happily not to such an extent, if we may judge from the fact that very frequently cart mares very vicious themselves produce remarkably good-tempered foals. In the higher-bred classes, however, it is more common, and precaution should therefore, if possible, be taken to avoid the risk of any vice being developed. Particularly should this exclusive principle be applied to the breeding of hunting-stock, for in the nature of every such first-class animal there should always be found the happiest combination of all good properties of form, constitution, and temper,—power and action condensed in compact shapes (bulk

always indicates, to a certain degree, *coarseness*), and an ever-cheerful temper, and ready energy of will to put all the hereditary physical strength and innate capability, when required, into use.

Having thus dwelt at perhaps greater length than was necessary upon the importance of a careful investigation into the pedigrees of both horse and mare from which it is intended to breed, and also assuming that due regard has been given to the adaptability, so to speak, of the one parent to the other in the various important points specified, we shall now consider the parents separately in detail.

First, *As to the Sire.*—We have invariably found in breeding hunting-stock that a short-backed thoroughbred horse put to a half-bred or three-parts-bred mare, of strong, well-built, lengthy frame, and *with good action*, as a rule produces the best stock. In fact, if this cross be followed in ordinary circumstances, and with no additional caution than is customary, the produce will almost invariably be very satisfactory, and the speculation comparatively safe. The thoroughbred to be chosen as a sire must, in a considerable degree, depend upon the mare he is to be put to; and nothing can be more fallacious than to suppose that one good sire, solely on his own account, should be retained in any large stud.

It is not desirable that there should be any remarkable or unseemly discrepancy either in the age, height, or breeding of the two parents. For example, the offspring from the union of a very old stallion with a strong healthy young filly will be found to partake too much of the dam in conformation, owing, we may suppose, to the vital principle in her being more vigorous than in her older consort, and *vice versâ*. Hence, therefore, unless it be desired to perpetuate such qualities as the stronger parent presents, unaltered in any considerable degree, such a congress is to be avoided. In *height* the difference is of less moment; but we may notice that it is always preferable to have the dam the larger and the taller of the two in every instance. And, as regards *blood*, let the discrepancy between the parents be as immaterial as possible. We have already said so much on this point that we need not repeat any argument against such a practice. The coarseness of the low-bred parent is sure to present itself in some way or other in the stock. They may be well-bred-looking animals, and well enough adapted probably for useful purposes, such as harness and light draught-work, and we have seen many good colts of this stamp got by thoroughbred sires from strong "clean-legged" cart mares, but as hunters or roadsters they are useless, and will consume just as much food, if not more, and require as much trouble and attention, as a better and "truer-bred" animal. It is a very objectionable practice, particularly tending to encourage such a style of breeding as this, to serve agricultural or cart mares at a lower service-fee than half-bred or higher-classed mares. Indeed, this custom should rather be reversed. The flaw in the escutcheon of the produce is certain to manifest itself in some

way—the sluggish nature and softness of the dam, or her disproportionate amount of offal, is almost sure to be presented. We recollect once having a chestnut filly whose symmetry and proportions were all that one could wish; her style of going, and whole *contour*, were undeniably good, and betokened no mean lineage, were it not that the coarse hair on her legs, and the tufts of her fetlocks and heels, were those of the Suffolk breed—arising, we must confess, from her grand-dam having been a pure mare of that race; and, consequently, her dam, being but once removed from the class, had partaken of, and again imparted, the grand-dam's conformation to a great extent; and thus the unfortunate beauty-spot came to be present (although, of course, to only a modified extent) after going through two generations. Such indications of low origin presenting themselves in many points, and most frequently about the head, neck, and mane, can only be avoided by a closer assimilation of the parents, constitutionally and anatomically; and to improve upon any good-shaped mare by imparting to her stock more blood, or upon any favourite thoroughbred sire by obtaining a progeny resembling him, but possessing more bone probably, and less breeding, the progress must be assimilative.

The judicious breeder will receive much aid in forecasting results in regard to the probable *"get"* of any stallion with any mare he wishes to put to him, if he can have an opportunity of seeing his stock and *their* dams. This is always, where it is practicable, highly desirable.

No stallion should be permitted to commence travelling before he is five years of age, to do him and his stock justice. He may, it is true, be allowed a *few* mares when rising *four* years old; but this, we think, is rather objectionable, and contrary to the laws of nature that such an office should devolve upon a horse till he be fully formed, and the ossification of his structure perfected and developed; and it is much more probable that degeneracy in the breeds will follow the use of a stallion undeveloped in his muscles and tendinous fibres and heads of the bones, than in using one in full possession of thoroughly matured powers, and arrived at a full-grown age. Nature in an immature condition is surely no match for nature perfect.

As regards height, we think that fifteen hands and a-half is a very fair average standard. With an inch over or under that mark we should not complain, other points being in proportion. Too tall a male is very objectionable, and has in our experience always proved so, the produce being generally remarkable for incongruous proportions; and although they may be "well topped," they are too frequently leggy and narrow-chested. The stallion should stand on flat-boned short legs, and be entirely free from any "tied-in" contraction at the cannon bone immediately below and behind the foreknees. His forelegs should be placed well out in front, so that he may cover the ground well, and stand squarely, not carrying his legs

under him. His legs should be free from all curbs, splints, spavins, or other such osseous deposits. If he be an aged horse, and have done much running, these flaws will be less discernible than if he were a younger stallion; for having become absorbed by age and work (not fatigue, which in youth rather tends to develop them), they will be less apparent. Notwithstanding this, however, they are equally apt to be transmitted to the progeny, for the blood becomes, through absorption, to a certain degree vitiated, contaminating the whole system; and this ossific diathesis is most certainly hereditary—more so, in fact, than in the case of a stallion younger, and exhibiting a curb or other such weakness in the crude state.

Particular attention should always be paid to the shoulder of the sire. The *upright* shape should always be avoided in breeding hunters; and in selecting a thoroughbred sire, great care is necessary to procure one with good *oblique* shoulders, and sharp on the top, at the mane, and *well laid back*. Deficiency in this too frequently begets a heavy forearm, and gives a tendency to stand with the forelegs drawn in under the belly, and general inferiority of carriage and action, if, indeed, these be present at all.

The hind hocks are another, and very material, point to look to in the choice of a sire. They should be "clean" and well formed, with the thighs immediately above the hocks, muscular and broad-set; for in this, with a good back and well-coupled-up loins, consists the leaping powers, and strength to throw himself over a fence. The feet should be particularly noticed—that the hoofs are free from sand-cracks and malformation; for even if a contraction through injudicious shoeing be there, it is very apt to be perpetuated hereditarily in the young stock. In fact, the hoofs and their formation should be always carefully scrutinised, for no part of the sire's confirmation is more usually, if defective, transmitted to his progeny than this. The fetlocks should be springy, not disproportionately long; and, above all things, let the fore pasterns not be short and upright. No horse with such a formation ever "gets away" freely, and is sure to be "hammered up" with the least fatigue. These points, then, seem to us the principal and salient qualities in a sire's conformation. The others, such as the head, which should be small, and flat and level in front of the eyes; and his neck, which ought to be long, and well-arched out at the cheek and throat; his back, which we prefer best to be short between the shoulder-blade and short rib; and his hind-quarters, which should be free from drooping,—are but secondary points in comparison with those we have detailed. His temper, and that of his ancestry, should be undeniably good, and docility should characterise himself. As to colour and markings, these are matters of taste entirely; some prefer white, others abhor a "blaze" or "white stockings," but "no good horse ever had a bad colour."

Let us now consider the dam or brood mare; and, as already men-

tioned in reference to her, we would remark that far too little attention is paid to her selection. It is a popular opinion (or, at all events, it is a common custom arising from the prevalence of such an opinion) to fancy any mare good enough to breed from; but there is no greater mistake into which many breeders fall than this. We believe that more depends on producing a good foal upon the mother than upon the sire. The very frequent custom of breeding from old and worn-out mares (although often *good* in their younger days) is highly reprehensible. Such animals seldom, if ever, produce stock of great value; and should it be wished to breed from any mare whose frame may be worn down by hard work or running, it is an excellent plan to allow her first a year's grass or "summering," to enable the constitution to become again "set up." Such a respite is well repaid in the future progeny; for after the nervous system has once become excited, the vital principle becomes disarranged, and an excitability of temper ensues, predominating over the muscular power of the mare, and consequently, as a rule, the stock inherits an irritable temper.

The question of age at which to commence breeding from a mare is one regarding which there is much variety of opinion. Some assert (and their practice is frequently followed) that a mare may, without injury to her constitution, be put to the horse at *two* years old. In our opinion, this is both unwise and to be censured. The principal argument—in fact, the only one in its favour—is, that it saves a year's keep of the dam, and does not injure her future usefulness. But we have found many cases where, at three years old, a mare, after being pregnant, failed to develop those good points of which she had given early promise; and it holds to reason, that equally with the mother, as in the case of the sire, any undue demand upon nature still undeveloped and not matured must be succeeded by a corresponding deficiency in such development in future; and can the progeny of a raw, young, imperfectly-matured filly be expected to turn out a first-class and perfectly well formed animal, or to possess that robustness of constitution which the offspring of an older, and consequently more matured, mother inherits? No; while nature, in the form of the dam, is employed completing and perfecting her work, it is too much to expect that she can, from those very vessels under her finishing hand, produce at the same time a fully-nourished new form. The nutriment which goes to the fœtus should be alone the nutriment of the mother's own frame; and "a year's keep" is surely expensively saved, if it be at the cost of the future development of the dam, and production of "a weed!" And, doubtless, many weeds must be ascribed to this very pernicious practice, the full evils of which only become apparent when the animal is arriving at a mature age, and should naturally be supposed to be at its best.

In our experience, from five to six years of age seems the best

period in a mare's existence at which to commence breeding from her. At such an age the breeder may hope for a continuance through many years of his mare giving him a foal; and when once a mother has proved herself capable of producing good stock, by all means, we say, continue to breed from her. For several reasons this is eminently advisable:—First, because she has proved herself to possess the requisite qualifications of breeding "true" to her own stamp, and to the lineage of her consort; Secondly, because we have frequently observed that such mares continue for years to breed finer and finer, gradually improving the quality of the stock if the sire's purity be adhered to; and, Thirdly, because a suitable consort has been found to beget in her the description of stock so much wanted.

When a mare is not put to the horse till she be aged, her stock is not likely to come to the same maturity or stature as that of a younger and more vigorous mother. As in the case of the sire, already referred to, if she have any inherent disposition to curbs, splints, spavins, and such deposits, her blood having become vitiated through their absorption, the chances are great that in every one of her foals, ere they are fully grown, such little defects will present themselves as shall not only lower their own value, but perpetuate such blemishes and evils to another generation.

Having then selected a mare adapted in age for a course of breeding, let us glance at a few of the more requisite points in her conformation and constitution. The first and grand virtue in every brood mare (but one too frequently little attended to) is *action*. This quality in a dam will render breeding or "blood" in her case less material, and we always prefer breeding from a plainer-looking mare if she possesses action, than from a fashionable-looking, higher-bred compeer without it. For it infers many other qualifications. It combines soundness with strength of muscle, and a healthy conformation of the legs and feet; and, besides this, it acts powerfully upon the offspring in preventing them taking too much after the racer style of going, and absence of knee action, so common in even the best thoroughbred sires. And as the muscles of locomotion are frequently considerably influenced by the nervous system, the style of action in a mare gives a very fair index, in many instances, to her temper and irritability.

In this particular (temper) it is also requisite to be careful in choosing a brood mare. It includes and implies docility to its full extent, and also courage, energy, and goodwill, to excite the physical powers and ability of endurance to the utmost, when required; and according to the ability of any hunter to exert these qualities to the fullest possible extent, will he take rank in the field and in the eye of every judge. Symmetry and size are of no avail without these great properties; and, as we think we have shown, the possession of them, in their primary degree, is *temper*. It is of much

importance in the selection of a dam for hunting-stock, and deserving of the utmost consideration, to choose a very lengthy roomy mare, on short legs, probably about 15 hands 3 inches in height. Let her be taller and larger in every way than the sire, if possible; possessed of a wide barrel, large and round without appearing "baggy," with back-ribs well coupled up, and the girth round her chest wide and full. If she have a good shoulder so much the better, but we do not insist upon that in selecting the cross which we have mentioned as in our experience the best—namely, a thoroughbred horse with a good shoulder and short back, and a lengthy half-bred or three-parts-bred mare. Her head should be well formed, and length and arch of neck is another desideratum. The bones of the legs should be flat, the fore arm should be brawny and muscularly prominent, all the legs be free from coarse hair as much as possible, and the hoofs should not be too flat and large, and the pastern joints, on no account, should be upright; the ears should also be well observed, as young stock very often follow the example of their dam in this respect. They should be fine and rather small, well pricked forward, and not wide set. The whole gait of the animal should be light and easy, and free from all symptoms of dull heaviness or sluggish motion. In a word, both sire and dam should display as little as possible of what is useless in any point; the greatest amount of good qualities combined in the most compact form of average size are what should be sought after in every instance.

The great difficulty in breeding is to retain sufficient size with an equivalent degree of muscle and spirit. Size or bulk, in either parent, indicates a degree of coarseness in proportion as it predominates, and is not any indication of additional physical power. It cannot be said to show endurance, as heavy horses are rather a burden to themselves than otherwise, especially in the hunting-field; and it is very difficult to procure a large heavy horse with breeding, sufficiently well provided with bone to render him lasting and enduring, when he has another's weight besides his own to carry across country.

Good wiry mares of bone and length, and well shaped, should always be chosen in preference to heavier animals, even if the sire be small himself. The produce of such will generally be found more handy, and to possess better symmetry, than the offspring of a union where the disparity in size is too apparent.

Large mares, moreover, we have frequently observed, are very uncertain in their foals; as a rule, these are either gigantic and coarse like the dams, or they take the other extreme, and prove puny weeds.

Incongruity in the proportions of the stock is the inevitable result of too wide disparity in the size and character (anatomically) of the parents.

But in selecting breeding parents we must not judge entirely by

their external conformation. That is frequently fallacious, and there are other and worse difficulties to be avoided. Let us strongly warn every one against breeding too much in and in, as productive of the utmost degeneracy in the produce; and although regard for a certain lineage may to some seem mere prejudice, there is, we believe, much truth in it. Some families are remarkable for the transmission, through several generations, of good or of bad points. "Phœnix," an old and well-known stallion, begat most of his progeny with coarse bad hocks—an evil which several of his sons have perpetuated in their offspring; and as it is with flagrant vices, so also is it, and happily in a greater degree, with the rarest qualities of blood, form, and temper. Constitutional unsoundness, and all hereditary infirmities, or even tendency to these, should at once exclude either sire or dam from the stud. These include the long list of ills to which fickle horseflesh is heir; and to secure a sound, healthy, powerful, and hardy offspring, the parents must not only themselves be free from all ailment (transmissible to their progeny) at the time of congress, but they should belong to families who have not been known to be remarkable for any peculiarity of form, or weakness of constitution, perpetuated or inherited from even a former generation. Lameness (other than the result of external accident), unsoundness of wind, even if caused by over-exertion, temper, colour, markings of white, are all hereditary. We may here notice a very curious instance of the effect of an accident in a mare being perpetuated in the case of her foal. A neighbouring farmer purchased, some years ago, a very nice-looking grey brood mare in foal. This was her first pregnancy. She had, through an accident, unfortunately got her eye knocked out, and owing to this blemish in her appearance, and subsequent habit of shying from her blindness on the one side, her owner gave up riding and driving her, and put her to the horse, intending to reserve her for breeding alone. Her foal was born, with the eyeball on the same side of the head on which its mother had received the injury, hanging out, and attached to the cheek-bone only by a thin piece of skin, which, of course, was at once cut away, and the unsightly object removed. This is certainly a remarkable instance, and is without any parallel in our experience. The mare was sold and lost sight of, unfortunately, so that we are unable to say if such a freak of nature was again repeated in her case.

As to colour and particular individual markings in horses, we have said that these are also hereditary. The former runs in particular breeds to such an extent as to render them distinguished by it. Thus we have the white or cream-coloured Arabian; the dun-coloured Siberian or Tartarian; the brown Clydesdale; the black Lincolnshire; the chestnut Suffolk; and the bay Cleveland.

Even acquired and artificial habits become hereditary; nor are they transmitted by the agency of both parents. The dam may be

very healthy, yet produce a weak and sickly offspring by one horse, when previously and subsequently her stock got by other stallions is perfectly robust and hardy; and *vice versâ* in the parents; for cases frequently occur where the dams are as much to blame as the sires in this respect.

Having thus cursorily noticed the primary physiological principles which should guide every judicious breeder of young horses—namely, the careful selection of parents, due regard to their mutual conformation and assimilation to each other, as well as to their temper and constitutional hardihood, the propriety of endeavouring to trace back their family lineages, and to avoid all coarseness or other inherent vice or bad characteristic, to exclude from the stud any animal (male or female) predisposed to constitutional disease, unsoundness, or hereditary (and, in some cases, acquired) weaknesses —due regard to all which essential principles will go very far to insure success in this difficult enterprise—let us now in a few words sum up at present our remarks on this interesting subject.

We have recommended that one parent (and we think the sire) should be thoroughbred. There can be no doubt that the agency of blood on the paternal side very materially benefits and improves the stock. Some, however, assert that using what is popularly termed a "hunting sire," or stallion who only wants one part from being purely thoroughbred, is advantageous. To this we do not assent. We have tried them, and think them miserable failures as sires of first-class hunting-stock. Such a horse may be calculated for getting from well-bred mares a stout, useful, strong-boned progeny well enough adapted for harness purposes, and in some cases for roadsters, but as a hunting sire the epithet is undoubtedly a misnomer. His offspring as a rule are less courageous, and far less enduring, than the stock of a good thoroughbred stallion. Why is a sire selected at all, if not that his progeny may resemble him? and as we have seen that the property of imprinting his own qualities upon his stock is founded mainly on the purity and antiquity of the lineage of both parents, it naturally follows that, if there be a deficiency in this respect on the maternal side, the sire must indispensably be *pure*. As the horse, which the breeder wishes reproduced, was got, so let him try to repeat that cross; and this is surely not done by breeding *from* him with a similar mare, which will be found frequently to incur the risk of producing the coarser types of the ancestry of either side in a mongrel degree.

We object also to Arabian sires. Their progeny are as a rule small, undersized, and light of bone. They may be "sweet-looking" symmetrical animals, with showy action, and are well enough adapted for lady's pads, for which they are more suitable than for use as hunters or roadsters for heavy weight. Their too upright shoulders form their chief objection, and is an almost invariable fault in Arab stock.

A powerful *slow* horse, if thoroughbred, is not so objectionable, as he may be of much use in crossing mares of different classes, and thus horses adapted for different requirements may be bred. He is probably the best sire for roadster stock if crossed with a lengthy mare possessing high action.

When a mare has once been stinted to any horse *not* thoroughbred, the effects of such a union will be more or less apparent in her after progeny, even if they be got by a thoroughbred stallion. The ovarian system of the dam seems to imbibe certain influences from the sire which go to modify her progeny by other subsequent males; and by repeated intercourse with different sires, year after year, the property which the mare had of communicating her own family likeness and characteristics to her stock becomes much impaired. It takes less, year after year, after the dam; and, assuming that thoroughbreds only are admitted to any mare, the quality of the produce becomes year by year of higher quality (*not weedy*), and more valuable.

Many instances of the effects of a previous fruitful intercourse presenting themselves in after years have come under our notice; but probably the most patent proof of it is to be found in the markings of white occurring in the produce of a sire and dam who are not only entirely free from any white themselves, but equally free from it in their ancestry, and which can only be accounted for by the fact that the mare had previously been served by a horse possessing such marks, either in his own form or in that of his family. We once had a dun-coloured filly by "Clansman" out of a Highland pony mare—not a bad cross, by the way, to rear strong, hardy, undersized horses for pony carriages—and the hocks and thighs, as well as the forearm and face of this filly were striped and brindled like those of a zebra, caused by the pony mare having been served the previous year, and with success, by a donkey! She was put again to "Clansman," and again had a filly foal, brindled and striped in the same manner, though less decidedly than in the previous filly, and year by year her foals presented this appearance, though becoming gradually fainter and less conspicuous each successive year, although never becoming entirely obliterated.

Markings of white are, as a rule, rather inherited from the sire than from the dam, and are traceable even to the grandsire and granddam.

New characters are sometimes implanted in stock, arising from the parents having been taken from their primitive condition and exposed to influences which are unnatural to them; and deviations in external structure of the stock are caused in like manner.

In these we include all such evils as contractions of the hoofs and feet, the result of bad shoeing; and they are not only themselves transmitted, but they frequently assume a more serious aspect than

mere malformations, causing a morbid local affection which often leads to permanent lameness and disease.

We have insisted thus much upon the influence exercised for good or for evil by the parents upon their progeny; and when any breeder has been so fortunate as to have found the combination of any two parents producing first-class stock for hunters and roadsters, we need hardly advise him to make no change by trying the services of another stallion, for after what has just been said he will probably find it impossible again to get the style of stock which he bred before he made the change of sire. Mares put successively to the same horse will continue to breed similar stock year after year.

To render more certain the state of pregnancy and the condition of the fœtus more perfect, the keep of the horse and mare should, if possible, be more closely assimilated to each other before coition; and to every brood mare such nutriment should be given as is best calculated to establish a vigorous constitution. Upon this the robustness of the foal depends in a great measure, for in feeding the dam, the offspring is being fed at the same time, and in due proportion. An excellent way to aid the mare in nursing her foal, and at the same time to benefit both mare and foal, is to allow the mare, when going at grass, a daily supply of bruised oats of best quality, given in a shed or other convenient place in her paddock. The foal will thus very soon learn to eat along with her, and when it is weaned, the allowance given the dam should be continued to the foal, and should be liberal, and with due regard, at the same time, to the size of its stomach. It is a common practice amongst farmers to allow their young stock to feed merely upon what they can pick up, or to stint their diet in a straw-yard. This is poor economy, and no breeder is worthy of having a good foal, however careful he may be in his selection of sire and dam, and observant of all other precautions to insure success, who starves (for the sake of saving the expense of keep) his foals in their tender years, by not allowing such nutriment and quality of diet, and in such quantities, as shall assist nature in developing all her noblest qualities.

The two principal causes of the deterioration in the particular breeds of which we have been treating are, we think, to be found, first, in the want of attention to the proper selection of parents; and secondly, in the imperfect attention to the comfort and nutriment of the progeny. Let it ever be remembered that "like will produce like," and that the offspring, stinted in its youth, will not fail in the after development and conformation to exhibit the traces of such bad economy when it is too late to remedy the evil.

REPORT OF EXPERIMENT ON AUTUMN AND SPRING MANURING.

By WILLIAM WALKER, Ardhuncart, Aberdeenshire.

[Premium—The Gold Medal.]

THE field selected for the experiment has a southern exposure, well sheltered from the north; elevation from 500 to 600 feet, lying inland, upwards of 30 miles from sea. The soil is a reddish loam about 12 inches deep, inclining to clay. Subsoil may be termed gravelly clay, naturally perfectly dry. The farm has been all wrought on a six-course rotation for the last twelve years:—1st, Turnips, laid down with 15 loads of farmyard dung and 6 bushels of mixed bones per acre, the tops of the turnips left on the ground and ploughed in; 2d, Oats or barley, sown out with a sufficient quantity of well selected grass seeds; 3d, 4th, and 5th, Grass pastured with cattle, or cut for hay as circumstances permit; 6th, Oats.

In the centre of the field 4 imperial acres were measured off containing 16 acres equal in quality and condition. 2 acres were dunged in the autumn on the oat stubble after lea with horse and cow dung well mixed together, at the rate of 15 tons per acre, ploughed in 8 inches deep. The other two acres set apart for spring manuring was ploughed immediately after, the same depth.

The land was not touched again till the 1st of May, when both plots were closely grubbed at an average of 12 inches deep, being in high condition, and pretty free of weeds of all description; and having been a considerable time exposed to the pulverising influence of the winter frosts, comparatively speaking little labour was necessary to bring any weeds that were to the surface, and reduce the soil to a satisfactory mould for subsequent operations.

PLOT No. 1.—*Autumn Manured.*

The drills opened 28 inches wide, slightly harrowed down before applying the artificial manure, which was, at the rate of 6 bushels of mixed bones and 2 cwt. of Peruvian guano, covered in and sown with best yellow turnip-seed on the 29th of May 1862.

PLOT. No 2.—*Spring Manured.*

Drills the same size. Same kind and quantity of dung as in No. 1. Put in the drills in the usual way. The same quantity of artificial manure, put above the dung, all covered in and sown on the 31st of May. Same kind of seed. About 10 days after both plots brairded well and thick; no difference could be observed between them.

The manure of all kinds applied was most carefully distributed on both plots.

Both plots were horse and hand hoed between the 8th and 10th of July; plants left 9 inches apart. Both plots gone over again, horse and hand hoed, on the 1st of August. Very little difference could be recognised between the plots during the season, except the autumn plot, which was scarcely so equal in the growth of the plants, and continued so all through. The spring manured plot was by far the most equal crop to appearance when pulled and weighed. Although not necessary for competition, I had both plots examined by two members of the Highland Society, who checked the measurement and found it correct. Both plots were weighed and stored between the 12th and last of November. The table annexed will show the results:—

	tons. cwt. qr. lb.	tons. cwt. qr. lb.
Plot No. 1—Autumn Manured.		
Weight of turnips topped and tailed per plot of 2 acres,	22 4 3 0	
Weight of tops on do.	6 16 0 0	
Specific gravity, 0.9215.		29 0 3 0
Plot No. 2—Spring Manured.		
Weight of turnips topped and tailed per 2 acres,	25 15 2 14	
Tops per do.	5 12 0 0	
Specific gravity, 0.9161.		31 7 2 14
Difference in favour of Spring manuring,		2 6 3 14

If we deduct the difference of specific gravity, which is scarcely worth doing, it will be seen by the table there is a considerable amount of produce in favour of spring manuring.

My past experience and observation bears me out in the opinion that autumn manuring has little to recommend it, unless that it may facilitate operations in the busy season of laying down the turnip crop; or, for instance, in many places in the upper districts of Aberdeenshire, where the land in some cases is so very steep that it is almost, if not altogether, impossible to put dung in the drills. In attempting to do so, I have found (with the greatest precaution) the drills so thoroughly obliterated by the carting of the dung that it was impossible to get the manure covered; consequently it was in a great measure lost. On such land I would recommend autumn manuring; but a better plan, I think, is to lay down the turnip crop with a sufficient quantity of extraneous manures to raise a crop, and either consume the crop on the ground with sheep, or if the crop is removed, give half a dunging of well-rotted manure, put on the surface and slightly ploughed in. I know of no better plan for fertilising very steep high-lying land. The grain and grass crops are always better than when the manure is put in the drills. This occasions a great deal of labour, but is repaid in many instances.

If required for cattle at the homestead, I have found as much benefit from leaving the tops on the ground and ploughing them in, as from either eating the crop with sheep, or giving a half dunging for the succeeding grain and grass crops, and much less labour.

I conducted a small experiment on autumn and spring manuring with different kinds of potatoes, in the same field where the other experiment was, and I may say with similar results. The autumn manured was about the same quality as the spring plot, but not so rich nor so equal in size. The varieties were Irish cups, long black kidney, and white rocks. The same results were observed in all the cases. The manure applied was, 15 yards of farmyard manure and 3 cwt. of dissolved bones per acre. I did not, however, weigh nor measure the produce, but formed my opinion from observation.

Experiment, 1863.—On the Grain Crop.

The drills of both plots were split and harrowed previous to being ploughed for the grain crop, in order to have any unexhausted manure more equally incorporated with the soil, for the better equalising of the succeeding grain and grass crops—a method which should always be adopted, if time will at all permit.

Both plots were sown on the 2d April with a drill machine, 3¼ bushels of English birley oats sown per acre, along with a sufficient quantity of well-selected grass-seeds, the grass-seeds slightly harrowed in, and then rolled again.

Braird came beautiful in both plots. No difference could be observed between either until the fall of the first leaf, when the autumn-manured plot looked exceedingly bad, and continued so more or less, in comparison with the other, throughout the season.

Both plots harvested on the 29th Sept., weighed on the steelyard and stacked October the 5th; all thrashed on the 10th; grain dressed, weighed, and deducted from the gross produce. I may mention that the young grass on both plots seems very much alike. I think, if there be any difference, the autumn-manured plot has the advantage. The following is the result of this experiment:—

Table

TABLE SHOWING THE RESULT OF EXPERIMENT.

OAT CROP, 1863. After Turnips.	Gross weight.	Quantity of dressed grain.	Weight per bushel.	Price per quarter.	Value of dressed grain.	Light oats.	Weight of light per bushel.	Value of light.	Weight of straw.	Rate per cwt.	Value of straw.	Total value per plot.
	CWT. QR. LB.	QR. B. LB.	LB.	S. D.	£ S. D.	B. LB.	LB.	S. D.	CWT. QR. LB.	S. D.	£ S. D.	£ S. D.
PLOT No. 1. 2 imperial acres, manured* on the stubble in autumn,	86 0 0	11 2 0	39	16 4	9 3 9	3 9	28	7 7	48 0 2	1 6	2 12 0	12 3 4
PLOT No. 2. Same extent manured in the drills in spring, ...	101 2 0	12 6 20	40	17 0	10 17 9½	3 2	31	8 3	63 0 22	1 6	5 15 9½	16 13 7
Difference in favour of Spring Manuring, ...												£4 10 3

* The manure applied was for the turnip crop; none applied for the grain.

The difference as shown by the tables in favour of spring manuring, both as regards the turnip and the grain crop, speaks for itself, and requires no remarks.

To show the effects of the two modes of manuring on the hay crop, I have sent in the result of this experiment also, which gives some further information on this subject.

The quantity of grass seeds sown in each plot along with the corn was 1 bushel of the best perennial rye-grass, 2 lb. of red clover, 2 lb. of cow-grass, and 1½ lb. of alsicke. The above quantity will be thought by many far too little, but I find it perfectly sufficient.

The grass appeared after the hay was cut, thickly planted; but on the autumn-manured plot a great many of the plants looked sickly through the winter, and died out, the cause of which I am quite unable to explain, as the other plot continued a fine thick sward all along; consequently the last-mentioned crop produced considerably more weight of hay.

To test the crop I measured off 40 poles in each plot. When the crop was ready—the clover full blown and the rye-grass about half full—each plot was carefully cut and colled by itself, weighed on the steelyard, and stacked in fine condition on the 9th of August.

Spring-manured plot gave 6 cwt. per 40 poles—or, on 2 acres, 2 tons 8 cwt.; value at 8d. per stone of 22 lb., £8, 2s.

Autumn manured gave per 40 poles, 5 cwt.—or at the rate of 2 tons per 2 acres; value at same rate per stone, £6, 15s. 4d. Difference in favour of spring manuring, £1, 6s. 8d. I did not observe any difference in the quality of either.

It will be seen at a glance at the result of this experiment, that autumn manuring has nothing of itself to recommend it, as it produced less valuable crops over the three years.

I may mention, in conclusion, that I highly approve of the suggestions given for conducting experiments in the last number of the Transactions by Professor Anderson.

ON MIXED PLANTATIONS.

By John Morrison, Coneypark Nursery, Stirling.

[Premium—The Medium Gold Medal.]

The skilful landscape-gardener must be considered as a true artist. His art is a combination of the florist's, forester's, land-surveyor's, architect's, and painter's; for he is called upon at times to exercise the skilfulness which belongs to each of these several professions, or to give an opinion on matters practically connected with some of their departments.

The effect which is produced in the appearance of a landscape by a judicious grouping of trees is very remarkable. Besides being in

themselves objects of great beauty, they impart an agreeable variety of colouring and shading to the landscape, and serve to show off with advantage all other objects seen along with them, whether in their immediate neighbourhood or at a distance. A level plain, however well cultivated, looks tame and monotonous unless appropriately relieved by strips or groups of planting; and even a single tree in a park is often acknowledged to be a decided outset. An exposed cottage on a rising ground looks solitary, cold, and cheerless; but peering out from amidst trees, the same dwelling seems the very picture of peaceful comfort and happiness. In this latter aspect there appears to be a most appropriate and even necessary connection between the house and the trees, not merely because the planting is required for shelter, but it seems to be absolutely demanded for the sake of its ornamental character. Such an example may serve to bring out the general principle, that a cottage being shown to more advantage when surrounded by a planting of trees, it should always be so provided and exhibited; and if this may be assumed as a general principle, it suggests the existence of certain laws of ornament as belonging to the art of the landscape-gardener. The application of these laws, however, must always depend upon circumstances; for they cannot be so clearly defined as to entitle them to be considered as absolute, neither are they so doubtful and unsatisfactory as to warrant their being altogether neglected.

In the formation of new plantations much might be done to secure the beauty of the scenery by such an arrangement of the different varieties of trees as would form an agreeable shading to the landscape. The lights and shadows shown in a great picture are its principal attractions; and as they give expression to the design of the artist, it is upon them that his chief attention is bestowed. In the same way, the harmony of colouring presented in the natural landscape must likewise be considered one of its most engaging features; and it should be the aim of the landscape-gardener to follow in every particular such a method of operation as will bring out this distinguishing quality to the best advantage, and at the same time prevent the exhibition of what may seem incongruous and inconsistent with the scene regarded as a whole. The motley mixture of the Scotch fir, the spruce, and the larch, shown in many plantations, in promiscuous position, even after the trees have attained their maturity, is far from producing a fine effect; and although such an arrangement might have been found necessary when planting, for the sake of providing suitable nurses, there is no reason why that order should continue to be maintained with the permanent trees.

Viewed from a short distance, a plantation presents the most imposing appearance when the trees are grouped or massed together according to their several varieties, and when all the irregularities

of the ground are taken advantage of in order to suit the most efficient display of the various kinds. And where the policies are of even limited extent, and the material placed at his disposal is comparatively scanty, the landscape-gardener who has taste and judgment will always make the most of his resources; and it is surprising, when skill is enlisted, how far slender means may be made to go, and how moderate-sized plantations can be made to look much more extensive than they really are. The opportunities afforded for the opening up of scenery worthy of being shown, or the shutting out from view such objects as are disagreeable or in bad keeping with the general prospect, by the judicious use of deciduous or evergreen varieties of trees, and preserving the sky-line perfect and unbroken, while at the same time it may be kept waving or undulating, are all points which the eye of the practical man will readily seize upon and turn to account.

Let us take for granted that the mansion-house is the stand-point from which the landscape should take its rise. In the laying-out of our ancient Scottish country-seats, the most seems to have been made of such material as could be obtained at the time—the oak, the ash, the beech, and the lime, with here and there a silver and Scotch fir, and perhaps a chestnut. But for the adornment of our modern parks a much more extensive assortment is demanded; and when so many valuable additions have been made to our list of trees, which now embraces foliage of the most beautiful and varied shape, and all shades of green, yellow, purple, and scarlet, much wider scope can be given to the taste for rural embellishment than could formerly be afforded. The style and grouping of the policies around the mansion-house must of course always be regulated by the situation and the nature of the ground, respect being had to the perspective view, while every knoll or elevation should be made available for the purpose of increasing the effect of the scene, and any notable prospect should be carefully kept open, with here and there a peep at such romantic-looking rocks or mountains as the vicinity can show.

Perhaps no part of landscape-gardening operations is more difficult to deal with than those which are proper to that portion of the policies which lie in the immediate vicinity of the mansion-house; and for the obvious reason, that the laying out and planting of that part of the grounds is subjected to a more frequent and closer inspection, and, as a matter of course, to more severe criticism, than the others; and forming as it does the foreground of the picture, it necessarily bears the responsibility of setting off the background to the best advantage. I merely refer to these facts in order to show the importance of considering well the whole ground and its bearings before commencing work at all, and also the effect likely to be produced upon those parts of the scene where

"Distance lends enchantment to the view,"

by any changes which may be proposed to be made close at hand.

But the mention of a subject by way of illustration may serve to make the above remarks more easily understood. And as it is difficult to make choice of a private demesne for such a purpose without perhaps giving offence, or running the risk of describing a place not generally known, I shall endeavour to obviate this by naming a mansion-house and grounds with which every Scotchman at least is familiar, and the esteemed proprietor of which is not likely to quarrel with us for so doing,—I refer to Holyrood Palace, the mansion of our beloved Queen, taking also the Park, Salisbury Crags, Arthur's Seat, and surrounding ground into account.

The east front of the Palace, extending to the approach-gate from the London Road, including both sides of the Drive, might with great advantage be planted to a certain extent. On the north side there are perhaps only two views worthy of being kept open; the first, a peep by the corner of the Royal Terrace across the Forth, and having the Fife hills as a background; the other, a prospect along the Forth, by the Bass Rock and seawards. If these two views were preserved, the remaining portion of this line should be closely planted up, so as to exclude some unsightly buildings and public works; and to do this effectively, a double row of trees in group would be required, consisting of deciduous and evergreen varieties alternately —the inner or wall line being composed of deciduous, and the outer or park line of evergreen varieties; and as the ground is somewhat narrow, it would be necessary to group the trees in triplets, and plant in zigzag form, as shown in the annexed diagram:—

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* 1 *     * 2 *     * 3 *     * 4 *
  *         *         *         *

        *         *         *         *
      * 1 *     * 2 *     * 3 *     * 4 *
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Such a double line of trees, consisting of eight groups of each variety, would, I think, be sufficient for the purpose above mentioned, and they might be composed and ranged as follows:—Inner line (deciduous), commencing at the foot of the Royal Chapel,—group 1, purple beech (*Fagus s. purpurea*); 2, scarlet oak (*Quercus coccinea*); 3, purple sycamore (*Acer purpurea*); 4, large-leaved maple (*A. macrophyllum*); 5, scarlet flowering horse-chestnut (*Æsculus rubicunda*); 6, variegated sycamore (*A. variegata*); 7, birch (*Betula alba*); 8, spanish chestnut (var. Knight's prolific, *Castanea visca*). Outer line (evergreen),—group 1, black American spruce (*Abies nigra*); 2, Cembran stone pine (*Pinus Cembra*); 3, Menzies's spruce (*A. Menziesii*); 4, mountain Weymouth pine (*P. monticola*); 5, the Douglas pine (*A. Douglasii*); 6, Austrian pine (*P. Austriaca*); 7, the Albert spruce (*A. Albertii*); 8, Lobb's arbor-vitæ (*Thuja Lobbii*).

As the ground becomes too narrow to admit of grouping being continued the entire way to the gate, the form of planting would therefore require to be altered, and carried on only in a double row, say of Pinus Austriaca and Abies nigra; but at the gate itself a fine large terminal group might be formed, composed of the beautiful weeping birch, acacia (*Robinia pseudo-acacia*), and Lombardy poplar (*Populus fastigiata*), intermixed.

The above would appropriately screen off from view all that is necessary to be excluded from the prospect in this direction; and the remaining portion of the park, on the same side, would admit of a few additional groups and some single specimens being inserted, and these might be planted parallel with, but at a suitable distance from, the railing in east front of the Palace. The specimens should comprise—(1) Picea nobilis, (2) P. Nordmanniana, (3) P. pinsapo, and (4) P. lasiocarpo,—which four would probably be found quite sufficient to form this line; and in front of these, eastward, let two groups be planted, consisting of (1) Acer Pennsylvanica and (2) double scarlet, double white, and single scarlet thorn; this latter group should be placed towards the Drive; while right in centre of these two, but extending to west end of drill-ground, another group, composed of Cedrus deodara, would show with immense effect.

Crossing the Drive to the foot of the hill, extending from the elbow of the Crags eastwards to St Anthony's Chapel, a great group of Abies, sorts, would stand with much advantage on the level ground. Norway spruce (*A. excelsa*) might be given as a background to show with greater effect Menzies's spruce (*A. Menziesii*), Douglas spruce (*A. Douglasii*), the white spruce (*A. alba*), the black spruce (*A. nigra*); while the lake in front of the Chapel I would surround with birch (*B. alba*), Abele poplar (*P. alba*), the Huntingdon willow (*Salix alba*); and at intervals Abies nigra and the hemlock spruce (*A. Canadensis*). The two last named would contrast favourably in summer with the foliage of the deciduous trees, and serve as a winter clothing when the others had shed their leaves. This towering clump would have a grand effect; and the old ruins of the Chapel would be considerably lightened up by having a few plants of the gold and silver striped elder (*Sambucus* var.) interspersed about it.

West of the lake we leave a wide entrance to Hunter's Bog, where a group of limes (*Tilia europæa*) and scarlet horse-chestnut (*Æsculus rubicunda*) would be in fine keeping; and advancing in the direction of the Lodge, a few single specimens of the upright elm (*Ulmus montana fastigiata*), the golden ash (*Fraxinus aurea*), the purple beech (*F. s. purpurea*), with small groups intermixed of Pinus Austriaca and Pinus maritima, might be planted with advantage. At the south corner of the Lodge a large cluster intermixed, and in a pear-shaped form, of Turkey oak (*Q. cerris*), scarlet oak (*Q. coccinea*), purple beech (*F. s. purpurea*), and syca-

more (*A. pseudo-platanus*), would show extremely well, extending from the Lodge southwards, and returning to the Palace along the Drive in an avenue of the sycamore, scarlet horse-chestnut, the lime, and beech (*F. sylvatica*), in equal proportions, sufficient space being left between each to admit of one Cedrus deodara on both sides of the Drive, and onwards the gold and silver striped holly (*Ilex variegata*) and common holly (*I. aquifolium*).

Passing round to the south-west front by Dumbiedykes and on by St Leonards, the whole of the buildings in sight require to be shut out from view of the park, and for this purpose I would plant a line of the Lombardy and black Italian poplars along the entire length of the wall; in front the Weymouth pine (*P. strobus*), Abies Douglasii, A. excelsa, and P. Austriaca, intermixed, would form a magnificent screen. The tall, pyramidal Lombardy poplar, with the broader set and more majestic black Italian poplar, and Pinus in front, would effectually conceal what is not wanted in the view at this point, and at the same time form in themselves very attractive objects.

The flat ground here, extending to both sides of the Drive and Old Meadows, would make a splendid pinetum, the soil and situation being suitable for almost all the varieties. The magnificent Wellingtonia would be entirely at home here, as also the deciduous cypress (*Cupressus distichum*), the pines, and abies; while the piceas, excelled by none of the others in beauty, would, as a whole, luxuriate in this part of the ground; likewise the cupressus, thujas, &c., &c. The pinetum could be finished off by a plantation of Pinus Austriaca and larch (*Larix europæa*) sloping up to and finishing at St Leonard's railway station.

Turning now to Salisbury Crags for the purpose of planting, the more rugged portions and jutting rocks ought to be left open and freely exposed. The Pinus mughus and P. montana might be interspersed here and there, but by no means so thickly as to conceal the wild beauty of the Crags. These two varieties get bushy and hang out from the rocks, and they would therefore be in fine keeping with the general outline. Where a suitable spot offered, one or two larch should be slipped in, and these would make tolerable trees, and at the same time form a fine mixture with the P. mughus: the bright green of the larch in spring and yellow in autumn would contrast well with the more sombre foliage of the mughus.

The steep braes sloping down from the Crags towards the valley might be appropriately covered with a wild intermixed mass of such as the sloe (*Prunus spinosa*), the hazel (*Corylus avellana*), the bird-cherry (*Cerasus padus*), thorns of sorts, double and single scarlet and double white cratagus, laburnum (*Cytisus laburnum*), elder (*Sambucus*) of sorts, intermingled with whin (*Ulex europæa*) and broom (*Cytisus scoparius*). In these we should have such a magnificent mass of wild luxuriance as would hide the present barren, uncouth-looking acres of quarry debris, and perfume the air for

several months in the year; while the same bold outline of the Crags being preserved, assisted by the few pines dropped in as proposed, would render the entire scene very different in appearance from what it is at present. Of course, some labour and expense would be incurred in accomplishing these improvements, but both would be well bestowed. It would be necessary, in clearing out the shivers, to form pits and fill them with good soil for planting, which would give the trees a fair start, and I have no doubt they would continue to thrive extremely well.

Extending up the hill beyond the Crags, but before entering on the higher slope, the larch and Scotch fir (*P. sylvestris*) could be massed in solid squares, so to speak, according as the several levels or inequalities occurred, and following the whole circle of the hill in one mass of Pinus Austriaca and Scotch fir, leaving the poll or summit bare and open as at present, that the magnificent view from it may not be interfered with.

If such a plantation as that now described were formed, the valley beneath should be bordered off, in a circuitous winding line, with birch, hawthorn in variety, willow, purple beech, purple sycamore, Acer negundo variegata, and scarlet oak. These might be massed according to circumstances, while at suitable intervals single specimens might be inserted, which would preserve a view here and there of the braes and cliffs; while along the same line a fine undergrowth could be given of ivy (*Hedera helix*), the honeysuckle or woodbine (*Lonicera* of sorts), sweet clematis or virgin's bower (*Clematis flammula*), Mahonia aquifolia, &c. The opposite side, to the west and south, on same level, ought to be made the counterpart of the margin now described along the Drive; while the knoll tapering towards St Leonards should be massed with birch and larch, which might be extended to the plantation ending at the pinetum. In finishing in this manner we have the most beautiful variety of colours of foliage, with all the various intervening shades contrasting or blending together. Seen from the glen, the braes and Crags form the lower sky-line, with here and there the pines dotted along, and allowing the eye to wander to the very summit of the Seat, where again we have the pines as a margin between us and the sky. Covered with such a profusion and variety of trees, this romantic and classic mountain would stand out a much more attractive object in the beautiful landscape than it even now is; while its proximity to such a noble city as the Scottish metropolis, and its being seen to advantage from so many different points, would render it famous to an extraordinary degree.

From the summit of the hill, sloping eastwards, a detailed and particular description of the various shelvings or plateaux that occur is perhaps not necessary to be given; it may be sufficient if we keep in view that, for the sake of preserving harmony of colour and general effect, each rising piece of ground of about the same level, although

separated by ravines or hollows, ought to be planted with the same variety of trees, such as Scotch fir, P. Austriaca, &c., while the hollows themselves may be larch or hardwood alternating; so that from different points of view the lights and shades of the various foliage may be best seen, or even the entire mountain itself made to appear as one vast plantation of the same variety, or very nearly so.

Proceeding in a general way with this extensive planting, we continue our course eastwards by St Anthony's Chapel and the Hunter's Bog; and for the back part of the Chapel a mixture of trees would be required, although the ground should by no means be packed; and at a distance from the ruins the black American spruce (*A. nigra*), Norway spruce (*P. excelsa*), Acacia robinia, and Cedrus deodara; while more in front, as already proposed, the variegated elder, bird-cherry (*C. padus*), and thorns of sorts. The two shelvings to the south and east of the Chapel would have a pleasing effect if planted, the lower one with sugar maple (*Acer saccharinum*), ash-leaved maple (*A. fraxinifolium*), scarlet oak (*Q. coccinea*), and a nice belting of Pinus laricio; the upper with Acer Pennsylvanica, common oak, and purple beech, and a belting of P. Austriaca.

As the Hunter's Bog is now used as a shooting ground, it may be a question whether its being planted of a dark or light shade would be the more appropriate. If a light shade should be preferred, by keeping sufficient open space in the centre of the ground for the purpose of ball practice, a broad belting of weeping birch, Huntingdon willow, with thorns of sorts, would form a very suitable mixture, to be followed with the Scotch fir upwards to the ridge of the hill. But if a dark shade should be considered better, the pines could be continued to the margin of the bog, taking the place of the birch, &c., and leaving a crown of pines beyond the butts.

In passing to the south side of the hill from St Leonards by Samson's Ribs, we come upon a splendid level, suitable for an oak and other hardwood plantation, together with several capital spots for some of our more notable pines. Again we climb the hill-side to the south, and plant in a manner similar to that suggested for the north and east,—although the Ribs could be much more easily planted than the crags; and in this locality there are also some excellent situations for clumps of pines of sorts. Descending to Duddingston Loch, it should be surrounded with the Huntingdon willow, Abele poplar (*P. alba*), the black Italian poplar (*P. monilifera*), alder (*Alnus glutinosa*), and, at a short distance from the water, with the birch. At this beautiful sheet of water we stand at the southern boundary of the royal demesne, and here our planting operations terminate.

With such an extent and variety of surface to work upon, anything like a minute detail of the proposed planting operations would extend this paper to an undue length; but the subject itself is extremely interesting, and the particular topic discussed is a most im-

portant matter. Attention is beginning to be directed throughout the country to the desirability and necessity of providing public parks for the recreation of the people, and in some of the cities and towns of Scotland these have already been laid out and planted, and are highly ornamental and much appreciated. I need not say how much the inhabitants of Edinburgh esteem their public parks and gardens, or how much these conduce to the embellishment and beauty of their otherwise magnificent city. But the grounds around Holyrood Palace, including Salisbury Crags and Arthur's Seat, present views of romantic interest and loveliness unsurpassed by any royal demesne in Europe; and their picturesque effect would be immensely increased by some such planting as I have now sketched. With her numerous and efficient educational and literary institutions, why should the "Modern Athens" not also have her "groves of the Academy," to which the sons of learning and science might conveniently retire and find soothing relaxation in the intervals of their severe studies?—

"Where rears the ash his airy crest,
And shines the birch in silver vest,
And the beech in glistening leaves is drest,
While dark between shows the oak's proud breast,
Like a chieftain's frowning tower."

And surely for the tourist no greater attraction could be added to the many already abounding in the city and its suburbs than the grateful shelter which might be afforded by the sweet sylvan retreats around the famous Palace of Holyrood. Coming to inspect the stately structure and its historical curiosities, he might also mark

"What time in many-coloured bowers,
Pale autumn wreathes his latest, loveliest flowers;
The rich luxuriance mark of every view,
The mild and modest tint, the splendid hue,
The tempered harmony of various shades!"

In 1851 it was permitted to erect the statue of Her Most Gracious Majesty, defrayed by subscription, in front of the Palace. Would the adornment of the Palace grounds, in whole or in part as now proposed, not be also allowed? If permission *were* given, what more suitable present could a loyal and attached people bestow upon their beloved Sovereign?

The following is a list of such varieties of trees as I consider suitable for giving a pleasing effect to the landscape during different seasons:—

English Name.	Scientific Name.	Spring Foliage.	Autumn Foliage.
The Ash,	*Fraxinus excelsior*,	Shining green,	Green to yellow.
Golden Ash,	*F. E. aurea*,	Yellow,	Yellow.
Aucuba-leaved Ash,	*F. E. aucubifolia*,	Yellow and green,	Yellow and green.
Entire-leaved Ash,	*F. E.* var.,	Green,	Green to yellow.

The common ash is so well known that little description of it is required; but the three last-named sorts here introduced contrast so beautifully with it as to foliage that they are worthy of remark and a place in any collection. The golden ash, displaying both in wood and foliage the fine golden tint of autumn throughout the season, is very conspicuous; and the aucuba-leaved, having beautifully mottled-like foliage, is very attractive; while the entire-leaved, although having nothing uncommon as to colour, is nevertheless very distinct and ornamental as regards shape of foliage.

The Beech,	*Fagus sylvatica,*	Shining green,	Yellow.
Purple Beech,	*F. s. purpurea,*	Purple,	Purple.
Larged-leaved Beech,	*F. s. macrophyllum,*	Shining green,	Yellow.

The beech is a highly ornamental tree, both as to habit and colour of foliage, and more especially the purple-leaved variety, which is very attractive when planted either as single specimens or in groups, care being taken that the other varieties of trees planted near them be of as light a colour of green or yellow as possible. The large-leaved variety is a much bolder-looking tree than the common, and is worthy of distinction. There are several other varieties of beech, such as the gold-striped or blotched-leaved, and the cut-leaved or fern-leaved, but neither of these are sufficiently ornamental for general purposes.

The Birch,	*Betula alba,*	Bright green,	Yellowish brown.

The beautiful birch hardly requires description. There are few trees better known, and I believe none more generally admired. The birch seems never out of place; its fine pendulous branches and pyramidal habit, with beautiful silver bark, render it suitable alike for the flat or knowy lawn. It is equally at home on the hill-side or among the craggy rocks, and will answer the grounds of the palace or the limited plot attached to the cottage.

Chestnut, Spanish,	*Castanea visca,*	Green,	Pale yellow.
Do. do. Knight's prolific,	*Castanea* v. Knightii,	Shining green,	Pale yellow.

The Spanish chestnut will always take a prominent place in park scenery, being a noble tree with fine foliage. Knight's prolific is by far the handsomest variety, being more upright in habit of growth, and having most beautiful shining green foliage.

Chestnut, Horse,	*Æsculus hippocastanum,*	Dark green,	Brown.
Do. do.	*Æsculus h. rubicunda.*	Do.	Do.

The horse-chestnut makes most admirable specimens, having broad-set, half-pyramidal heads; and when the scarlet-flowering are planted side by side with the white flowering or common while in flower, are truly pretty. Add a lime tree to the group as a back-ground, and the picture is complete. The rich golden tints of the lime harmonise with the brown of the chestnut, and the formation of head of each sort dovetail them, as it were, together.

The Elm,	*Ulmus montana,*	Dark green,	Brown.
Purple Elm,	*Ulmus m. purpurea,*	Purple and green,	Brownish.
Upright Elm,	*Ulmus m. fastigiata,*	Green,	Green.
English Elm,	*Ulmus campestris,*	Green,	Yellow.
Cork-barked Elm,	*Ulmus c. suberosa,*	Green,	Yellow.

The elm holds a prominent place in most collections, and deservedly so, for if properly trimmed when young, few trees can compare with it, either as single specimens or for forming an avenue. The upright variety is very striking and pretty. The purple elm is only so on the back of the leaf, but its roughness prevents the colour being shown to the extent desired. The cork-barked and common English elm make fine specimens, and are very effective, the smallness of their foliage having a pleasing contrast with montana.

Cypress, deciduous,	*Taxodium distichum,*	Pale green,	Brown.

The beautiful fern-like foliage of this tree gives it a first claim for ornamental planting. It makes a fine specimen as to shape, and its foliage is truly lovely. It thrives best when somewhat sheltered, and in a rather deep and moist soil.

Laburnum, Scotch,	*Cytisus L. alpinus,*	Shining green,	Yellow.
Laburnum, common,	*Cytisus Laburnum,*	Green,	Yellow.
Laburnum, purple,	*Cytisus L. purpureum,*	Green,	Yellow.

The laburnums are well known and highly ornamental, their foliage in September and October being nearly as brilliant as their flowers are in early summer. The purple variety is very striking, often having purple and yellow flowers on the same trees. The above three varieties ought to be strewn about the outskirts of pleasure-grounds, and are extremely pleasing when seen from a short distance.

Lime Tree,	*Tilia europæa,*	Pale green,	Yellow.

The lime is a tree of great excellence, making most handsome specimens of pyramidal shape when planted singly. They are finely adapted for a screen or as an avenue line, and have a pleasing effect on the landscape in autumn, their beautiful yellow foliage then contrasting favourably with most other trees.

Locust Tree (*Acacia*),	*Robinia pseudo-Acacia,*	Green,	Yellow.

The acacia is of rapid growth, and comparatively hardy, and shows in pleasing contrast with most other trees.

Maple, striped barked,	*Acer striatum,*	Green, tinged with yellow,	Pale yellow.
Maple, large-leaved,	*A. macrophyllum,*	Brownish green,	Brown.
Maple, Norway,	*A. platanoides,*	Bright yellow,	Yellow and purple.
Maple,	*A. Pennsylvanicum,*	Beautiful yellow,	Reddish yellow.
Maple, silver,	*A. negundo fol variegata,*	Silvery white,	White.
Maple (Sycamore),	*A. pseudo-platanus,*	Pale green,	Brown.
Maple, variegated,	*A. p.-p. variegata,*	Striped,	Striped.
Maple, purple,	*A. ,, purpurea,*	Purple,	Purple and brown.

Among all our ornamental trees there is no tribe more worthy

of cultivation than the Acer, with their most beautiful, varied, and fantastically-cut foliage, comprising all the shades of green, yellow, white, striped, red, and purple. They are attractive in the highest degree, and readily adapt themselves to various soils and situations, while some of the varieties are of very rapid growth, such as macrophyllum, platanoides, rubrum, and the sycamore. They ought to be much more extensively cultivated than they appear to be; indeed, no ornamental planting is complete without a sprinkling of the Acers.

Oak, English,	*Quercus robur,*	Bright yellow,	Brownish.
Oak, scarlet,	*Quercus coccinea,*	Sulphur-yellow,	Purple and scarlet.
Oak, Turkey,	*Quercus cerris,*	Green,	Greenish brown.
Do. do. variegated,	*Q. c. variegata,*	Silver-striped,	Silver-striped.

The oak is among trees what the lion is among beasts—the monarch of the forest—and has associated with it all that is grand, noble, and majestic. Being so well known, anything like particular description is perhaps unnecessary. The British oak is an ornamental tree of the highest order as to specimen, and when unfolding their bright yellow leaves in May the trees are objects of increasing beauty. The Scarlet oak has a higher claim on account of the loveliness of its foliage, and retains the fine pale yellow colour of leaf during the month of June, changing to purple and scarlet in September and October. The Turkey oak, with its bright shining green and finely-carved foliage, makes a very graceful tree; and the silver-striped variety, with the same shining green and clear silver lacing, has a most cheerful appearance. There are several other varieties of the oak which might have been named and described, but the three last mentioned, being sufficiently dissimilar in foliage and handsome as specimens, will serve the purpose of this paper.

Oriental Plane,	*Platanus orientalis,*	Grey green,	Brownish.
Western Plane,	*Platanus occidentalis,*	Dull green,	Brown.

The plane is the most characteristic and ornamental tree we have. Where they thrive they make magnificent specimens. They like a somewhat sheltered situation and a good deep loam. The colour of the foliage either in spring or autumn is not so much a distinguishing feature as its shape and general appearance, which render the trees very striking objects in the landscape.

Abele Poplar,	*Populus alba,*	White and green,	White and green.
Black Italian Poplar,	*Populus monilifera,*	Yellowish green,	Bright yellow.
Lombardy Poplar,	*Populus fastigiata,*	Pale green,	Brownish.
Balsam Poplar,	*Populus balsamifera,*	Yellow,	Brownish.

The poplars are useful as well as ornamental for planting in and around policies. The Abele and Black Italian varieties will thrive well in moist situations, such as river-sides and on the border of lakes, &c., and they are also of very rapid growth. The surface of the leaf of the Abele, being of a fine shining green, while the back is of a beautiful downy white, is shown to great advantage when it

is stirred by the breeze. The Black Italian variety has a cheerful pale-green-coloured leaf, and makes a very handsome specimen, retaining the foliage and colour longer than any other variety of poplar.

Service Tree,	*Pyrus aria,*	Grey green,	Brownish green.

The service tree is very ornamental, having fine grey-green foliage, is half pyramidal in shape, and makes a beautiful mixture among the darker-foliaged trees.

Tulip Tree,	*Liriodendron tulipifera,*	Pale green,	Rich yellow.

A very beautiful and highly ornamental tree, foliage being nicely cut like a saddle, and of an extremely rich yellow colour in autumn.

Thorn, single scarlet,	*Cratægus oxyacantha punicea,*	Bright green,	Yellow.
Thorn, double scarlet,	*Cratægus o. flora plena,*	Bright green,	Yellow.
Thorn, double white,	*Cratægus o. f. p. alba,*	Bright green,	Yellow.

The thorn, although not growing to a large tree, is highly ornamental to the lawn. These three are perhaps the prettiest and most useful amongst the many varieties—the beautiful scarlet blossom of the one and the large trusses of pure white of the other being very striking. There is something peculiarly sweet and homely about the thorn which makes it a universal favourite.

Walnut,	*Juglans regia,*	Shining green,	Brown.

A noble tree, and well worth a place in every lawn of sufficient extent to admit it.

Willow, Huntingdon,	*Salix alba,*	Silvery grey,	Silvery.
Willow, Bedford,	*Salix Russelliana,*	Greyish green.	Brownish.
Do. Seaside or Comewell,	*Salix,* var.	Grey green.	Brownish.

The willow is a most useful and certainly very ornamental tree. The Huntingdon variety delights in comparatively swampy ground, and thrives well on the margin of rivers and lakes. When the trees are full grown and have their pendulous branches drooping over or kissing the stream as it passes along, or dipping into the placid waters of the lake, they appear in fine keeping with the scenery. The Bedford variety is more upright in habit and less downy, although very pretty, and makes fine specimen trees. The Comewell or Seaside variety is not so fine in form or foliage, but is better adapted for some purposes than the others. The former are *fresh-water* willows, while this is a *salt-water* variety, and is therefore most useful for planting our islands. If an entire line were planted between the sea and the land, and cut over at different heights, and thereby caused to stool out, or even if a double or triple line were thus planted and topped, it would form an excellent guard against sea spray and high winds. Also, where a few are dotted through the regular planting they shelter and nurse the plantation wonderfully.

In the above list of ornamental trees I have entered none but such as I think are strictly suitable for the purpose, and at the same time useful. The pines I have not considered it necessary to parti-

cularise as to colour of foliage. The whole are ranged according to the best of my judgment; and if the paper should be considered serviceable in some degree in promoting a higher style of landscape ornamentation, and thereby further one of the many laudable objects of the Highland and Agricultural Society, I shall feel satisfied.

ON THE RECLAMATION OF WASTE LAND.

By Charles Sangster, Balnabreich, Brechin.

[Premium—The Gold Medal.]

I entered as tenant of the farm of Balnabreich, at Martinmas 1859, upon a nineteen years' lease. The farm extended to 258 acres arable and 23 of pasture, besides a considerable extent of land under wood, at the yearly rent of £340 for the arable and pasture land, and £10 for the woodland; a portion of the woodland I was at liberty to improve. Immediately on getting possession of the farm, I began to improve the woodland, and by Martinmas 1860 I had, by trenching and draining, reclaimed 57 acres 9 poles, and made it fit for cropping.

The trenching cost £675, 15s. 7d. The expense of clearing the ground of tree-roots and stones, after the wood was off the ground, which I did with my own servants and horses, I estimate at £4 per acre, amounting to £228. I have paid for cutting and filling up again 557 chains of drains, £77, 4s. 2d., and for tiles for the same, £70, 15s.

All the above work has been done at my own expense, without any assistance from Government grant, or any promise of help from the proprietor.

The land thus reclaimed, with the exception of 7½ acres, was a regular forest of wood, with a black or yellow soil lying on a clay subsoil. The 7½ acres was a thorough swamp or bog, with several pools in it, and a good deal of wood in different places. The woodland was formerly let yearly for pasture at a rent generally of about £2, 10s.

The removal of the stones and of the roots of trees was a work of considerable difficulty; and the drainage of the 7½ acres of bog was very difficult indeed. It was so soft that it was scarcely possible to pass over it without sinking through the surface, except when planks of wood were laid for the purpose. On cutting below the surface, the soil was found in so liquid a state that it was necessary, in many places, to carry a quantity of the surface near the spots where the drains were to be put, and to throw over this as much of the under

surface as would lie without running back into the drain. After allowing the drain to be in that state until the soil that had been thrown out became somewhat firm, I proceeded to dig as deep as the softness of the ground would permit. I then laid in a five-inch pipe with collars. After a time I removed the pipe and deepened the drain as much farther as possible, and then relaid the pipes and collars. By this time I was pretty well through the soft boggy surface, and was reaching the top of the gravel. Two or three weeks afterwards I proceeded to dig well down into the gravel, where I got a great quantity of water, as much as filled a five-inch pipe for a leader; and by putting in branch drains into the bog I got it at last thoroughly dried.

Almost another 12 acres required drainage; but by going 3½ to 4 feet deep I always found, as before, a good open drawing bottom below the clay.

In spring 1860 I had about 20 acres of the newly-trenched land under crop; but owing to the backwardness of the season and the state of the ground, which was much poached with dragging off the tree-roots and stones, the seed was late in being got in. Where earliest sown there was a good crop; but the later the sowing, the crop was always the poorer.

I used 6 bushels of oats and 2½ cwt. of Peruvian guano per imperial acre. I considered that the crop did no more than cover the expense of seed and guano, and labour in laying it down, and gathering and removing the small roots that were on the surface.

In autumn 1860 I had all the ground cleared of roots and stones so far as I was able. A number of the roots were so large that they could not be pulled out, even with three or four horses, so that I allowed them to remain, and sowed round about them for two seasons; and in the end of harvest 1862, when they had become much lighter, I had them all removed. Many of the stones were of such a size that they had to be blasted with gunpowder in order to render them manageable.

In spring 1861 I put the whole of the trenched ground into oats, and had a very fair crop all over, except on 10 or 12 acres that had not been drained. I used 6 bushels of oats, and 2 cwt. Peruvian guano, and 1 cwt. blood manure per imperial acre. I estimate the average produce at 3 qrs. per acre.

In autumn 1861 I had the whole of the trenched land ploughed with three horses in the plough. Being exposed to the frost all winter, it was well pulverised; and in spring 1862 I had 46 acres sown with oats—with 6 bushels of oats, and 3 cwt. Peruvian guano per acre. I estimate the return at 4 quarters and 6 bushels per acre, worth £7, 2s. 6d. Eight acres, after carrying two crops, were sown in turnips. The ground was ploughed like the rest in autumn with three

horses; in spring I gave it 50 bushels of lime per acre, on the frosted surface, and a double tining of iron harrows. I then drilled the ground without cross-ploughing or grubbing, and then laid down with 15 bushels of mixed bones and 2 cwt. of blood manure per acre. There was a good crop of turnips, worth £6 per acre. I tried 6 drills at the rate of 15 yards dung and 8 bushels bones per acre; but I could not distinguish the difference but by the marks after growing. I had also three acres in potatoes laid down with 3 cwt. of guano and 50 bushels of lime. This was a very good crop, and quite free from disease.

When I entered on this farm at Martinmas 1859, there was a very poor crop of turnips, all diseased with finger-and-toe. Part of them was valued to me at £2 per acre. In a short time they were nearly all gone, not a single cartload being left on an acre. On my entry, and ever since, I have ploughed the land intended for turnips next season as soon as the harvest was finished, as deep as three horses were able to do with a large plough, and allowed it to remain in that state till the proper time for laying down the turnips. I never cross-plough or grub, but have always given from 50 to 60 bushels of lime to the acre, according to the nature of the ground. I then gave one or two double turns of heavy iron harrows, then raised the drills, and then put the circular harrows over them.

In 1860 I had no dung for the turnips, it being all required for the former turnip-field which was to be sown out. I accordingly gave for the turnips 16 bushels mixed bone-dust and 2½ cwt. of blood or turnip manure per acre, and put on the dung next spring before ploughing for the barley. In 1861 I pursued the same plan, using all the dung I had for the field after turnips. In spring 1862 I continued to work on the same system, but had as much spare dung after manuring the land that had been in turnips as went over nearly all I had for turnips, at the rate of 20 yards of dung per acre. The remainder was laid down as in the former two years. Since following this system of liming, I have never been troubled with finger-and-toe amongst my turnips on any part of the farm since I began to labour the ground in the way I have described, and have never had a single failure of the turnip crop. The farm has now been wrought on a five years' rotation for the last twenty years. I am now changing into a six-years' rotation—viz., three crops of grass, followed in succession by oats, turnips, and barley. The farm had become almost incapable of growing turnips.

I may mention in addition, that I have expended upwards of £350 in the drainage of the land formerly in cultivation.

Cost of Improvement.

Trenching,	£675 15 7
Clearing the ground,	228 0 0
Cutting and filling drains,	77 4 2
Tiles for the same,	70 15 0
	£1051 14 9
Per Imperial Acre,	£18 9 0

Statement of Crop 1861.

Oats for seed per acre,		£1 0 0
Guano,	do.,	1 6 0
Blood manure,	do.,	0 8 0
Labour,	do.,	0 13 6
		£3 7 6
Produce, 3 qrs.	do.,	4 10 0
Profit,		£1 2 6

Statement of Crop 1862.

Oats for seed per acre,		£1 0 0
Guano,	do.,	1 19 0
Labour,	do.,	1 0 0
		£3 19 0
Produce, 4 qrs. 6 bus. do.,		7 2 6
Profit,		£3 3 6

FIELD EXPERIMENTS ON THE ACTION OF URIC ACID AS A MANURE.

By Thomas Anderson, M.D., F.R.S.E., Chemist to the Society.

It is admitted on all hands that nitrogen can only be absorbed by plants when it exists in the state of ammonia or nitric acid; and when it is offered to them in any other form, such as in that of gelatine, in which it exists in bones and most manures of animal origin, it is indispensable to its manurial action that these substances should undergo complete decomposition, and yield up their nitrogen in the form of ammonia. If this be the case, it becomes important to determine whether nitrogen possesses an equal manurial value in all forms; for it may be urged with some show of probability, that it must act better, or at least more rapidly, when it exists in a manure as ready-formed ammonia, than in those cases in which that compound has to be produced by a decomposition, which in some cases may be very slow. And following out this view, it may even be asked, Whether it is not conceivable that compounds may exist in which the nitrogen is so effectually locked up in the form of indecomposable compounds as to be entirely inaccessible to plants? So far as ordinary manurial substances are concerned, entire inaccessibility unquestionably never occurs; for all the nitrogenous compounds existing in them are sin-

gularly prone to change, and sooner or later yield ammonia; but it is certain that in some instances decomposition is much slower than in others. It might, therefore, be expected that some difference should exist in the manurial value of nitrogen in different forms, but chemists have generally gone on the assumption that in all those compounds in which it is usually encountered in manures, whether as ammonia or in any other condition, its practical value is the same, although it is possible that there may be some difference in the rapidity with which it becomes available to the plant.

The results of field experiments, when critically examined, seem to confirm this view, and it has, therefore, been customary for many years to reckon the whole of the nitrogen in any manure as if it were ammonia; and I am not aware that any practical difficulty or error has resulted from this course. The question, however, has been recently again opened up by Liebig; and in discussing the manurial value of Peruvian guano, he has particularly insisted on the well-known fact that part of its nitrogen exists as ammonia, and part as uric acid; and contend that, as we know nothing of the manurial action of the latter, the nitrogen it contains should not be taken into account in estimating the value of that manure, but that it should be assumed to have no action on plants until the reverse is proved. As less than half the nitrogen of a Peruvian guano exists in the state of ammonia, and as by far the larger part of its manurial value is due to its nitrogen, it is manifestly a matter of great importance to the farmer to know whether he is justified in ignoring all that which exists in any other form; and the question is one which cannot be restricted to ammonia and uric acid, but may be raised with regard to any other nitrogenous compound; so that, should this view turn out to be well founded, it might be necessary to fix, by elaborate and frequently-repeated field experiments, the special agricultural value of nitrogen in every form in which it is used by the farmer—a course which would inevitably involve him in great difficulties and uncertainties.

The importance of ascertaining the accuracy of this opinion is so great that I have been induced to undertake some experiments in the field for the purpose of throwing some light on the subject; and I owe to my friend Mr Thomson, Grange, Kilmarnock, the opportunity of having them carried out. Mr Thomson has not only supplied the land for the purpose, but has himself superintended the details, and much of the value of the experiments depends on the care he has devoted to them, and for which I take this opportunity of expressing my thanks.

The experiments, which were conducted on both turnips and wheat, were directed to the determination of the relative effects of manures otherwise identical in composition, but containing the whole of their nitrogen in the form either of ammonia or uric acid.

Peruvian guano was the starting-point of the inquiry, and a sufficient quantity of a genuine cargo was carefully mixed after the lumps had been reduced to powder, and uniformity secured by passing it twice through a fine sieve. A sample of this guano was then analysed, and found to contain:—

Water,	16.60
Organic matter and ammoniacal salts,	50.01
Phosphates,	22.39
Alkaline salts,	9.54
Sand,	1.46
	100.00
Ammonia.	18.46
Phosphoric acid in the alkaline salts, equal to 6.85 phosphate of lime,	3.17

A large quantity of this guano was carefully burnt to an ash. This operation was performed in the laboratory, and it proved very troublesome and laborious, the appliances of a laboratory not being well suited to what was in reality a manufacturing process. It was found impracticable to burn it perfectly white; but the product was carefully mixed, and the quantity of charcoal left in it accurately determined, so that the percentage of pure ash was thus known. Another portion was boiled with hydrochloric acid, for the purpose of obtaining uric acid. It was digested, in the first place, with about half its weight of the acid for some days, and the solution which contained the phosphates and ammonia was separated by straining through cloth, after which it was boiled with a fresh quantity of acid; and this was repeated until it was found that the insoluble matter contained only a minute trace of ammonia. The removal of the ammonia was found more troublesome than was expected, and required long-continued boiling with acid. The residue consisted of impure uric acid, and the quantity of pure acid present was ascertained by determining the quantity of nitrogen it contained, the uric acid being calculated from the mean of two closely corresponding experiments. The sulphate of ammonia used was also analysed, so that the exact amount of ammonia contained in it was accurately known. Peruvian guano, guano ash, uric acid, and sulphate of ammonia, then formed the materials employed in these experiments; and the principle on which they were used was this: Peruvian guano formed the standard, and it was contrasted with a mixture of its own ash with uric acid in such proportion as to contain exactly the same quantity of nitrogen as the guano itself did, and with a similar mixture of the ash with sulphate of ammonia. The crops thus received in every case exactly the same quantities of mineral matters and nitrogen, but the latter element existed in one case entirely as uric acid, in another entirely as sulphate of ammo-

nia, and in the guano itself partly as ammonia and partly as uric acid. From the difficulty of preparing the guano ash and uric acid in large quantity, it was absolutely necessary that the experiments should be made on a very small scale, and the size selected was $\frac{1}{120}$ of an acre. This being a much smaller size of plot than is usually employed, I think it right to explain that great care was taken to measure the ground with accuracy; and Mr Thomson's experience in small experiments enabled him to do this with ease and precision; and I will only add, that all the precautions described in my paper on 'Experimental Agriculture' in the October Number of the 'Transactions' was carefully attended to. The ground was carefully marked off; and in the case of the wheat each plot surrounded with galvanised iron wire, so that its produce was kept quite separate.

EXPERIMENTS ON TURNIPS.

These experiments were made on yellow turnips, which were sown on the 3d June, too late to obtain the most favourable results, but which was unavoidable in consequence of the preparation of the uric acid having occupied a much longer time than was anticipated. The experiments were divided into three sections, on each of which a different quantity of Peruvian guano formed the standard.

Section 1st	was manured at the rate of	720 lb.	Peruvian guano	per acre.
„ 2d	„ „	360	„	„
„ 3d	„ „	240	„	„

The first section, therefore, got twice as much manure as the second, and three times as much as the third, and the largest quantity was nearly 6½ cwt. per acre, 720 lb. being selected instead of 728, because it was easily divisible by 120. The necessary quantities of guano, ash, uric acid, and sulphate of ammonia, to be used in each section, having been carefully calculated and weighed out, they were mixed with a quantity of damp sand, so that they might be applied without loss. The actual arrangement of the three sections was as represented in this diagram; but for convenience of reference they are placed in the following field-plan of the experimental results as if they had been parallel to one another.

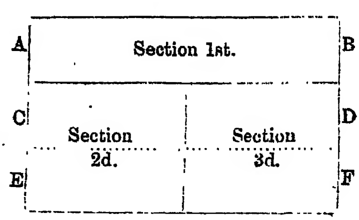

Table I.—Field-Plan of Experiments on Turnips, Showing the Position of the Plots, the Manure used, and the Amount of Crop Produced, in lb.—

Index.

N = No Manure.

A = Peruvian Guano Ash.

U = Do. + Uric Acid.

S = Do. + Sulph. Ammonia.

G = Peruvian Guano.

Section 1*st*, Manured = 720 lb. Peruvian Guano per acre.

Section 2*d*, Manured = 360 lb. do.

Section 3*d*, Manured = 240 lb. do.

Section 1st.		N 1.	A 2.	U 3.	S 4.	G 5.	N 6.	G 7.	S 8.	U 9.	A 10.	N 11.
	Bulbs,	136.0	175.0	215.5	228.0	225.5	136.5	213.0	241.5	202.5	183.0	139.0
	Tops,	46.5	58.0	101.0	110.5	105.0	47.5	98.5	115.5	89.5	58.5	49.0
Section 2d.		N 12.	G 13.	S 14.	U 15.	A 16.	N 17.	A 18.	U 19.	S 20.	G 21.	N 22.
	Bulbs,	103.0	185.5	190.0	179.0	136.0	96.5	115.0	143.5	156.5	161.0	95.0
	Tops,	26.0	65.5	63.5	59.5	37.5	26.0	30.5	41.0	44.5	48.0	26.0
Section 3d.		N 23.	A 24.	U 25.	S 26.	G 27.	N 28.	G 29.	S 30.	U 31.	A 32.	N 33.
	Bulbs,	116.5	146.0	187.5	219.0	194.0	114.0	167.0	172.5	166.0	136.0	120.0
	Tops,	38.0	45.5	74.0	82.0	75.5	37.5	53.5	57.0	55.5	42.5	38.5

Table II

TABLE II.—Giving the RESULTS of the EXPERIMENTS on TURNIPS, arranged, and the Average Quantity produced by each Manure.

Nothing.					Guano Ash.					Guano Ash and Uric Acid.					Guano Ash and Sulphate of Ammonia.					Guano.					Nothing.				
Plot.	Whole.	Bulbs.	Tops.	Tops per cent.	Plot.	Whole.	Bulbs.	Tops.	Tops per cent.	Plot.	Whole.	Bulbs.	Tops.	Tops per cent.	Plot.	Whole.	Bulbs.	Tops.	Tops per cent.	Plot.	Whole.	Bulbs.	Tops.	Tops per cent.	Plot.	Whole.	Bulbs.	Tops.	Tops per cent.
													Section		1st.														
1	182.5	136.0	46.5	25.4	2	283.0	175.0	58.0	24.9	3	316.5	215.5	101.0	31.9	4	338.5	228.0	110 5	32.6	5	330.5	225.5	105.0	31.8	6	184.0	136.5	47.5	25.8
11	188.0	139.0	49.0	26.1	10	241.5	183.0	58.5	24.2	9	292.0	202.5	89.5	30.6	8	357.0	241.5	115.5	32.3	7	311.5	213.0	98.5	31.6	6	184.0	136.5	47.5	25.8
Avr.	185.2	137.5	47.7	25.7		237.2	179.0	58.2	24.5		304.2	209.0	95.2	31.3		847.7	234.7	113.0	.		321.0	219.2	101.7	31.7		184.0	136.5	47.5	55.8
													Section		2d.														
17	122.5	96.5	26.0	21.2	16	173.5	136.0	37.5	21.6	15	238.5	179.0	59.5	24.9	14	253.5	190.0	63.5	25.0	13	251.0	185.5	65.5	26.1	12	129.0	103.0	26.0	20.1
23	154.5	116.5	38.0	24.6	24	191.5	146.0	45.5	23.7	25	261.5	187.5	74.0	28.3	26	301.0	219.0	82.0	27.2	27	269.5	194.0	75.5	28.0	28	151.5	114.0	37.5	24.7
Avr.	138.5	106.5	32.0	23.1		182.5	141.0	41.5	22.7		250.0	183.2	66.7	26.7		277.2	204.5	72.7	26.2		260.2	189.7	70.5	27.1		140.2	108.5	31.7	22.6
													Section		3d.														
17	122.5	96.5	26.0	21.2	18	145.5	115.0	30.5	20.9	19	184.	143.5	41.0	22.2	30	201.0	156.5	44.5	22.1	21	209.0	161.0	48.0	22.9	22	121.0	95.0	26.0	21.5
33	158.5	120.0	38.5	24.3	32	178.5	136.0	42.5	23.8	31	221.5	166.0	55.5	25.0	30	229.5	172.5	57.0	24.8	29	220.5	167.0	53.5	24.2	18	151.5	114.0	37.5	24.7
Avr.	140.5	108.2	32.2	22.9		162.0	125.5	36.5	22.5		203.0	154.7	48.2	23.7		215.2	164.5	50.7	23.6		214.7	164.0	50.7	23.6		136.2	104.5	31.7	28.2
												Total			Average.														
	154.7	117.4	37.3	24.1		193.9	148.5	45.4	23.4		252.4	182.3	70.0	27.7		280.0	201.2	78.8	28.1		265.3	191.0	74.3	27.0		153.5	116.5	37.0	24.1

TABLE III.—AVERAGE RESULTS of EXPERIMENTS on TURNIPS calculated on the Acre.

	Nothing.				Guano Ash.				Guano Ash and Uric Acid.				Guano Ash and Sulphate of Ammonia.				Guano.				Nothing.			
	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.
Section 1st.																								
Bulbs,	7	7	1	8	9	11	3	4	11	3	3	20	12	11	1	24	11	14	3	12	7	6	1	0
Tops,	2	11	0	12	3	2	1	12	5	2	0	0	6	1	0	8	5	8	3	24	2	10	3	16
Section 2d.																								
Bulbs,	5	14	0	12	7	11	0	8	9	16	1	4	10	19	0	12	10	3	1	0	5	16	1	0
Tops,	1	14	1	4	2	4	1	24	3	11	1	24	3	17	3	16	3	15	2	4	1	13	3	24
Section 3d.																								
Bulbs,	5	15	3	20	6	14	1	24	8	5	3	0	8	16	1	0	8	15	2	24	5	11	3	24
Tops,	1	14	2	0	1	19	0	12	2	11	2	16	2	14	1	8	2	14	1	8	1	13	3	24
Total Average.																								
Bulbs,	6	5	3	4	7	19	0	12	9	15	3	0	10	15	2	8	10	4	2	16	6	4	3	8
Tops,	1	19	3	24	2	8	2	16	3	15	0	0	4	4	1	20	3	19	2	12	1	19	2	16

On examining these results, we are immediately struck by the small amount of the produce obtained, which, even with the large amount of 720 lb. of guano per acre, does not much exceed half a crop, although the season was on the whole very favourable to the turnip. Mr Thomson, however, explains that this is due to the late period at which the experimental plots were sown, in consequence of which they lost the advantage of the months of May and June, which were moist and peculiarly fitted for starting the crop, and encountered, during the early stages of their growth, the drought of July and August, during which they made but little progress.

The number of plots to which no manure was applied, distributed through different parts of the ground, enables us to draw some interesting conclusions regarding the variations in the productive capacity of the soil itself. When the Nothing plots of Section 1st are compared, it will be seen that the produce in each corresponds most closely, for there is obtained—

	Bulbs.	Tops.
Plot 1, . .	136.0 lb. .	46.5 lb.
„ 6, . .	136.5 . .	47.5
„ 11, . .	139.0 . .	49.0

than which no closer approximation could be expected or desired. But it is otherwise when the Nothing plots 1, 12, and 23 are compared, the difference being then very marked. Mr Thomson thus explains the cause of this discrepancy:—"The reason is, that the land on which these experiments were made is somewhat ridge-shaped, the highest part of which would be represented by a line drawn from C to D (see diagram, page 424). The soil here is shallower, and the crop is consequently less. The crop is larger between A and B than between E and F, because the slope is less steep on the one side than the other. All lines parallel with AB, CD, and EF are level from end to end, and all plots situated on the same line are, as the Nothing plots prove, strictly comparable. The variation of soil, therefore, though it invalidates the comparison of one section with another, does not affect the results of each section by itself, the plots in which are strictly comparable." The results, in fact, offer an instructive illustration of the advantages of small experiments; for it may be safely asserted that, had half or quarter acre plots been used in this case, it would have been impossible to trace the gradual changes in the soil with the precision which is here practicable.

Comparing, then, the results in each section with one another, it is to be observed that in every case the mixture of guano ash and sulphate of ammonia has given the best result. After it comes the guano itself, and then the uric acid mixture. The conclusion, therefore, is favourable to the ready-formed ammonia as a source of

nitrogen in this case; but, as we shall immediately see, the experiments on wheat by no means confirm this inference, and it is necessary to inquire how far the particular circumstances under which the experiments were made may tend to affect the results. The unusually dry weather of July and August were necessarily unfavourable to the decomposition of uric acid; and it is quite conceivable, and indeed highly probable, that the existence of the ammonia ready formed in the sulphate may have given that substance an advantage it would not have possessed in ordinary seasons. Whether this be the correct explanation of the case or not, it seems clear that further experiments of the same kind are required to set this point at rest.

The effect of nitrogenous manures on the proportions of bulbs and tops is very curious. It appears in Section 1st that the tops on the Nothing plots are just 25 per cent of the entire produce, and they are practically the same when guano-ash was used; but where nitrogenous substances occur in the manure, they are raised to 31 per cent. A similar though less striking effect is observed in Section 2d; but it disappears in Section 3d, where the quantity of manure is much smaller.

(To be continued.)

LIST OF VETERINARY SURGEONS WHO HAVE GRADUATED AT THE VETERINARY COLLEGE, EDINBURGH, SINCE ITS CONNECTION WITH THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1823.*

	Abbot, Charles,	Manchester,	1841
	Ainslie, John Aldington,	London, *dead,*	1835
	Aitkin, Alex. Murray,	Australia,	1841
	Aitkin, David,	Dunfermline,	1852
	Aitkin, John,	Edinburgh,	1836
	Aitkin, John,	Dalkeith,	1841
	Aitkin, Robert,	Felton, Northumberland,	1836
	Aitkin, William,	Kilmarnock,	1832
	Aitkin, William,	Edinburgh,	1849
10	Aked, John,	Blackburn, Lancashire,	1844
	Allen, David,	Renfrewshire,	1839
	Allen, Thomas,	Perthshire,	1839
	Allison, William,	Thornley, Durham,	1840
	Amos, Alexander,	Gorebridge,	1841
	Anderson, James,	Leicester,	1828
	Anderson, John,	Liberton, *dead,*	1835
	Anderson, John,	Royal Artillery,	1858
	Anderson, Robert,	Lanark,	1853
	Anderson, William,	Glasgow,	1835
20	Anderson, George W.,	Rayne, Aberdeen,	1864
	Anderson, Hugh,	Army,	1863
	Armitage, George,	Fence Houses, county Durham,	1852
	Arthur, Robert,	Monkland Iron Works,	1842
	Ashe, Edward Evanson,	Cork,	1849
	Atkinson, Frederick,	Cartmel, Lancashire,	1847
	Auckland, Joseph,	Elgin,	1840
	Austin, John Thomas,	Huddersfield, Yorkshire,	1857
	Bain, Peter,	Doune, Perthshire,	1863
	Baird, Colin Campbell,	Cupar, Fife,	1852
30	Bale, James,	Otley, Yorkshire,	1860
	Balfour, Andrew,	Balweary, Kirkcaldy,	1844
	Balfour, George H., M.D.,	Edinburgh,	1843
	Balfour, John,	Montrose,	1861
	Ball, Joseph,	Royal Artillery,	1852
	Ball, Thomas,	Manchester, *dead,*	1850
	Barber, Robert H.,	Australia,	1845
	Barclay, James,	Perthshire,	1844
	Barker, Charles,	Malton, Yorkshire,	1849
	Barker, John,	Australia,	1838
40	Barker, John,	7th Dragoons,	1852

* In addition to those who have graduated, the course of lectures has been attended by nearly 1000 students who did not apply for the diploma.

	Barker, William,	Middlesbro', Yorkshire,	1843
	Barker, Thomas,	Stokesley, Yorkshire,	1864
	Barr, Robert,	Irvine, *dead,*	1826
	Barr, William,	Stair, Ayrshire, *dead,*	1840
	Barr, John,	Irvine, Ayrshire,	1862
	Barlow, John,	Cheshire, *dead,*	1844
	Barron, James,	Aberdeenshire,	1857
	Barron, George,	Echt, Aberdeenshire,	1856
	Barron, Neil M.	Old Deer, Aberdeen,	1861
50	Barron, Edward,	Dublin,	1862
	Barton, Charles E.,	East India Company,	1849
	Barton, John,	Lancashire,	1844
	Baxter, David,	Perth,	1851
	Baxter, James,	Errol,	1843
	Baxter, John,	Campbelltown,	1836
	Baxter, William,	Dundee,	1846
	Beattie, George,	Langside, Aberdeenshire,	1850
	Bell, James,	Dupplin, Perth,	1859
	Bell, John,	Carlisle,	1858
60	Bell, Luccock,	Paris,	1845
	Bell, John,	Clonmel, Ireland,	1861
	Berrie, William,	Whitehouse, Aberdeen,	1851
	Bey, William,	Tarland, Aberdeen,	1851
	Bird, James,	Bervie,	1854
	Bird, William,	Belford, *dead,*	1851
	Birdsall, Francis,	Dozenhand, Norfolk,	1848
	Bisset, James,	Brechin,	1839
	Bisset, John,	Montrose,	1834
	Bisset, Benjamin M.,	Brechin,	1864
70	Blackie, James,	Bellshill, Lanarkshire,	1859
	Bland, George,	Alfreton, Derbyshire,	1851
	Boag, William M.,	Morpeth,	1842
	Boag, William,	Kilham, *dead,*	1843
	Bodington, George,	Cauton, Cardiff,	1846
	Booth, George,	Dundee,	1847
	Borrowman, A.,	Kirkcaldy, *dead,*	1847
	Borrowman, James,	Little France, Edinburgh,	1837
	Borthwick, John,	Kirkliston,	1844
	Borthwick, James,	Australia,	1850
80	Bowie, Andrew,	Hawick,	1827
	Bowie, James,	do.,	1851
	Bowman, John,	Elvington, Yorkshire,	1852
	Bowman, Thomas,	Fridaythorpe, do.,	1845
	Boyce, John H.,	Adlingfleet, Goole,	1862
	Brackenridge, Alex.,	Holytown, Lanark,	1861
	Bradshaw, Charles,	Mauritius,	1856
	Braime, George,	Methley, Yorkshire,	1858

	Breakell, James,	Preston,	1854
	Bremner, George,	Monikie, Forfarshire,	1860
90	Brenning, Richard,	Waterloo, Liverpool,	1842
	Brett, Alfred,	Edinburgh,	1862
	Bridge, Roger,	Bury,	1850
	Briggs, John,	Coventry,	1841
	Brockhurst, Lewis,	Hastings,	1838
	Brockie, James,	Marnoch,	1852
	Brodie, John,	Dunse,	1829
	Brooks, William Mason,	Breedon, Leicestershire,	1856
	Brosnan, John,	Tralee, Ireland,	1860
	Brotherton, Richard,	Australia,	1843
100	Brown, James,	North Berwick, *dead*,	1844
	Brown, Andrew John,	South Hindley, Yorkshire,	1856
	Brown, John,	West Calder,	1859
	Brownlee, David,	Coatbridge, Lanarkshire,	1844
	Bryce, John,	Stirling,	1836
	Bryden, James,	Liverpool,	1857
	Buchanan, Duncan,	Kenmore, Perthshire,	1854
	Burbage, John H.,	Calcutta,	1860
	Burnett, Robert,	Glasgow,	1864
	Butler, Walter S.,	Dalkeith, *dead*,	1836
110	Byrne, Luke,	4th Dragoon Guards,	1842
	Byrne, John H.,	Naples, Italy,	1863
	Cade, Thomas,	Bristol,	1849
	Cairncross, Peter,	Alyth, Forfarshire,	1855
	Cairns, James,	Farnell, Forfarshire,	1858
	Caldwell, Alexander,	India, *dead*,	1846
	Callender, Joseph,	Falkirk,	1864
	Campbell, John,	7th Madras Light Dragoons	1842
	Campbell, Peter,	Waltrie, Fife,	1843
	Campbell, Thomas,	Yonderton, Ayrshire,	1854
120	Campbell, Thomas,	Kirkcudbrightshire,	1859
	Capes, William,	Bridport, *dead*,	1852
	Carlisle, Edward,	Carlisle,	1852
	Carlisle, William,	Wigton,	1847
	Carmichael, Alexander,	Ripon,	1840
	Carrick, William,	Cupar Fife, *dead*,	1824
	Cassie, John,	New Machar, Aberdeenshire,	1861
	Challinor, Alfred,	Pendlebury, Manchester,	1864
	Chalwin, E. G.,	India, *dead*,	1848
	Chalwin, Thomas,	Sussex,	1853
130	Chambers, Evander,	Half-pay 1st Dragoons,	1850
	Chambers, George,	Tarves, Aberdeen,	1834
	Chambers, Robert,	Liverpool,	1857
	Chambers, William,	do., *dead*,	1854
	Charles, J. W.,	Accrington,	1840

	Cheetham, J. P.,	Keswick, *dead,*	1828
	Cherry, Alfred H.,	Clapham, *dead,*	1844
	Chisholm, Alexander,	Blacksheils,	1861
	Clarke, James,	Musselburgh,	1855
	Clarke, John,	Auchinbowie, Stirling,	1832
140	Clark, William B.,	Cambridge,	1844
	Clelland, George,	Rosewell, *dead,*	1834
	Clelland, James,	Coldstream,	1831
	Coates, Thomas,	Barden Mill, Northumberland,	1860
	Cockburn, John,	Haddington,	1838
	Coleman, Edward,	London,	1856
	Collins, Francis F.,	16th Lancers,	1847
	Collins, James,	6th Inniskilling Dragoons,	1852
	Connacher, George,	Perth,	1857
	Connachie, James,	West Struther, Berwickshire,	1860
150	Connachie, William,	Selkirk,	1858
	Constant, Stephen,	5th Dragoon Guards,	1846
	Cooper, Job,	Market Weighton, Yorkshire,	1855
	Copeland, Henry,	Garstang, Lincolnshire,	1853
	Copeland, Laurence,	Shiffnal, Salop,	1855
	Corbett, John,	Simonburn, near Hexham,	1826
	Corcar, Chambre,	East India Company,	1854
	Coupland, William,	Little Sutton, Cheshire,	1863
	Crighton, James,	Cupar-Fife, *dead,*	1834
	Crombie, James,	Dunfermline,	1846
160	Cross, George,	Urie, Aberdeenshire,	1834
	Corsland, George,	Victoria,	1850
	Cuming, M. A.,	St John's, Newfoundland, *dead,*	1846
	Cunningham, Andrew,	Slateford, *dead,*	1849
	Cunningham, Cornelius,	Slateford,	1859
	Cunningham, William,	Kilmarnock,	1827
	Currie, John,	Bowland, Galashiels,	1838
	Currie, Robert G.,	Aberdour, *dead,*	1860
	Dale, Arthur D.,	Cadishead, Lancashire,	1864
	Dalzell, Allan, M.D.,	Lecturer on Chemistry and Materia Medica, Edinburgh Veter. College,	1857
170	Danby, Frederick	Holtby, Yorkshire,	1864
	Darling, F. B.,	late Australia,	1848
	Dawson, Jacob,	Kettering, Northampton,	1860
	Dawson, John,	Strathdon,	1843
	Day, Frederick J.,	York,	1850
	Deuchars, Robert,	Cruden, Aberdeen,	1849
	Dewar, William,	Midmar,	1839
	Diack, George,	Old Meldrum, Aberdeenshire,	1857
	Dickie, James,	Auchencruve, Ayrshire,	1859
	Dickie, Robert,	Ayr,	1861

180	Dickson, John,	Dumfries,	1864
	Dickson, Thomas,	Dumfries, *dead,*	1840
	Dixon, William,	Manchester,	1856
	Dixon, James C.,	Peebles,	1862
	Dobie, William,	Pierseton, Ayrshire,	1857
	Dobson, John,	March, Cambridgeshire,	1847
	Dobson, Robert,	Seton, Haddington, *dead,*	1842
	Dodds, Robert,	Kirkcaldy, *dead,*	1825
	Dodds, Robert S.,	Alnwick,	1857
	Doig, John,	Wigtown,	1850
190	Dollar, John,	Paris,	1855
	Dollar, Thomas A.,	New Bond Street, London,	1851
	Donaldson, John,	Paisley,	1835
	Donaldson, James,	Paisley,	1861
	Donaldson, John,	Paisley,	1862
	Douglas, George,	Woolsthorpe, *dead,*	1843
	Douglas, John,	New Cumnock, Ayr,	1857
	Dow, John,	Birnam, Dunkeld,	1860
	Drynan, Thomas,	Ballantrae, Aberdeen,	1849
	Drysdale, James,	New York,	1833
200	Dudfield, James,	Rose, Gloucester,	1854
	Dudgeon, David,	Tynningham,	1849
	Duff, Archibald,	Edradour, Perth,	1832
	Dun, Finlay,	Shipston-on-Stour	1849
	Dun, Robert,	Edinburgh, *dead,*	1854
	Duncan, Alexander,	Methlic, Aberdeen,	1851
	Duncan, Archibald,	Colinsburgh, Fife,	1834
	Dundas, George,	Wick, *dead,*	1858
	Dunlop, Alexander,	Airdrie, *dead,*	1837
	Dunlop, John,	Dreghorn,	1859
210	Dunlop, Andrew,	New Zealand,	1862
	Duns, W. E.,	Dunse,	1863
	Dycer, Edward,	Dublin, *dead,*	1838
	Dycer, William,	Dublin, *dead,*	1841
	Eaglonson, John,	Stranraer, Wigtown, *dead,*	1844
	Eastcott, William,	Broadwood, Devonshire,	1863
	Edmonston, Andrew,	Aberargie, Perth,	1835
	Edwards, John,	Abergele, Wales,	1858
	Elam, William,	Huddersfield,	1846
	Ellison, Alexander,	Tain, Ross-shire,	1847
220	Erskine, Robert,	Grantown, Inverness,	1863
	Evans, William,	Co. Cork,	1863
	Ewan, David,	Barry, Forfarshire,	1851
	Faichney, John,	Douglas, Isle of Man,	1853
	Fairley, John,	Glamis, Forfarshire,	1857
	Falconer, Daniel,	Loanhead,	1848
	Falconer, John,	do., *dead,*	1835

	Farquhar, William,	Ayrshire,	1848
	Farrell, Hiram,	E.I.C., Bombay,	1858
	Farrell, James,	Dublin,	1851
230	Fawcett, Benjamin,	Ponteland,	1855
	Ferguson, George,	Craighead, Perthshire,	1829
	Ferguson, James,	Cuba,	1839
	Ferguson, Patrick,	Peebles,	1833
	Fergusson, John H.,	Ayr,	1862
	Ferris, John,	Devonshire,	1856
	Field, William Allan,	London,	1857
	Fields, William,	Beverley, Yorkshire,	1862
	Findlater, Richard,	Carstairs, Lanarkshire,	1844
	Fingzies, James,	Kinross,	1860
240	Fisher, John,	Whitehaven,	1852
	Fitzwigram, Lieut.-Col. F.,	15th Hussars,	1854
	Fleming, George,	3d Hussars,	1855
	Fleming, William,	Oldham,	1861
	Fogan, James,	Northumberland, *dead*,	1859
	Forbes, Charles,	Aberdeenshire,	1841
	Forrest, Samuel,	Carluke, Lanarkshire,	1842
	Forsyth, Robert,	Portobello,	1837
	Fraser, Alexander,	Marnoch, Banff,	1856
	Fraser, Charles,	Limerick,	1841
250	Frater, William,	America,	1830
	Frater, William,	Hawksland, Lanarkshire,	1864
	Friend, William,	Walsall,	1848
	Fry, Thomas,	Virginstone, Devonshire,	1854
	Fulton, David,	Mullingar, Ireland,	1859
	Fulton, John,	Ayr, *dead*,	1830
	Fulton, Gilbert,	Liverpool,	1836
	Ganley, Andrew,	Dublin,	1860
	Gardiner, James,	Alexandria by Dumbarton,	1830
	Gardner, B. R. C.,	Staff Veter. Surgeon, Army,	1843
260	Gardner, Charles,	Toronto,	1844
	Gavin, William,	India,	1845
	Gill, David	Aberdeenshire,	1858
	Gillespie, John,	Lockerbie,	1856
	Gillespie, Alexander,	Wooler,	1861
	Gilmour, John,	Clonmel, Ireland,	1850
	Gladwin, Edward,	Manchester,	1854
	Glass, John W.	Coldston, Aberdeen,	1843
	Gleig, William,	Hatton of Fotheringham, Forfarshire,	1850
270	Glennie, Matthew,	Coupar-Angus,	1843
	Gofton, John,	Rothbury, Northumberland,	1862
	Glover, Robert H.,	Dumfries, *dead*,	1841
	Gordon, William,	Kirkmichael,	1860

	Goudie, John,	Hinckley, Leicestershire,	1846
	Gould, William,	Whitchurch, Shropshire,	1864
	Gow, Alexander,	Blair-Athole,	1857
	Graham, Young R.,	Birmingham,	1847
	Grainger, James,	Rosewell, Edinburgh,	1844
	Grant, Norman,	Dalrey, Forres,	1850
	Grant, Robert,	Craigbegg, Inverness-shire,	1857
280	Gray, Alexander,	Edinburgh,	1836
	Gray, Edward Simpson,	8th Hussars,	1839
	Gray, Thomas,	India, *dead,*	1846
	Gray, John,	Craigie Burn, Lanarkshire,	1860
	Gray, Charles,	Wishaw,	1861
	Grierson, William,	Kirkcudbright,	1844
	Grieve, James,	Crossgate, *dead,*	1829
	Guthrie, David,	Forfar,	1858
	Haggard, Edward,	America,	1839
	Halfey, Joseph,	Southport, Lancashire,	1858
290	Halket, Alexander,	America,	1840
	Hall, Charles,	Staffordshire,	1854
	Hall, R. W.,	Oxford, *dead,*	1845
	Hall, William,	6th Dragoon Guards,	1861
	Hall, Robert,	Stockton-on-Tees, Durham,	1864
	Hallen, J. H. B.,	E.I.C., India,	1848
	Hamilton, Alexander,	New Zealand,	1861
	Hamilton, John H.,	Kandy, Ceylon,	1862
	Hammond, William,	Witton-le-Wear,	1845
	Hardy, Adam,	Roxburgh, America,	1844
300	Hardy, William,	Durham,	1861
	Harrison, George,	Croft, Leicester,	1842
	Harrison, John,	Brough, Westmoreland,	1857
	Harrison, Nicolas,	Swansea, Wales,	1863
	Haslam, James N.,	Manchester,	1859
	Haunsell, William,	Staithes, Whitby,	1839
	Hampton, Peter,	Arbroath,	1851
	Hay, G. W.,	Boswell's Green,	1837
	Hay, John,	Lauder, Berwickshire, *dead,*	1848
	Hay, Thomas,	Kirkmichael, Banff,	1850
310	Haycock, William,	Manchester,	1842
	Healey, Michael F.,	Army,	1861
	Heard, William,	Launceston, Cornwall,	1850
	Heard, Edward H.,	Carrick-on-Suir,	1864
	Hely, F. A.,	Carrickmacross, Ireland, *dead,*	1849
	Henderson, Alexander,	Aberdeenshire,	1857
	Henderson, William,	Roxburghshire, *dead,*	1841
	Hepburn, John,	Laurencekirk,	1842
	Hepburn, John,	Milnathort,	1850
	Hepburn, William,	Laurencekirk,	1839

320	Hepburn, William,	Kinross-shire,	1857
	Hepburn, Michael,	Blair-Adam,	1863
	Herd, John,	Appleby, Westmoreland,	1845
	Herriott, Arthur,	Polmont, Stirlingshire,	1831
	Hick, William,	Fulford, York,	1851
	Hill, E. B.,	Forfarshire,	1848
	Hill, William Wyatt,	Coderhead, Lancashire,	1856
	Hill, William F. H.,	Cheshire,	1857
	Hill, H.,	Cadis Head, Lancashire,	1863
	Hodgson, Septimus,	Cumberland,	1854
330	Hogarth, George,	Berwick-upon-Tweed,	1842
	Horner, Francis,	Bingley, Yorkshire,	1863
	Horsburgh, David,	Dalkeith, *dead,*	1851
	Horsburgh, James,	Dalkeith,	1835
	Houston, George,	Midlothian,	1844
	Howatt, Bryce,	Londonderry, Ireland,	1858
	Howatt, John,	Pollockshaws,	1848
	Howie, James,	New Deer,	1847
	Hulme, Peter Leicester,	Manchester,	1850
	Hume, James,	America,	1853
340	Hunter, James,	Confunderland, Aberdeenshire,	1862
	Hurst, Henry,	Liverpool, *dead,*	1842
	Hurst, James,	do.	1851
	Hutchinson, Hope,	Scone, *dead,*	1827
	Hutchinson, John,	South Shields,	1855
	Illensworth, Thomas,	High Hesket,	1854
	Irvine, John,	Castle-Douglas,	1840
	Jack, William,	Montrose,	1858
	Jack, John,	Inverkeillor,	1864
	Jackson, Thomas,	Portadown, Armagh,	1861
350	Jaffrey, Thomas,	Forres,	1852
	Jebson, James,	Bishop Wilton, Yorkshire,	1854
	Johnson, James,	Cruden, Aberdeenshire,	1832
	Johnson, James,	Millerhill, Edinburghshire,	1844
	Johnson, William,	Roslin,	1836
	Jones, Owen,	Anglesea,	1853
	Jones, Hugh,	Paygrove, Caernarvonshire,	1864
	Kay, James,	Forfar,	1834
	Kay, James,	Forgandenny, Perthshire,	1846
	Kay, John,	Pontefract, Yorkshire,	1843
360	Kelly, Alexander,	Edinburgh,	1862
	Keith, Alexander,	Old Deer, Aberdeen,	1853
	Keith, William,	New York,	1858
	Kennedy, Thomas,	Wrexham,	1847
	Ker, James,	Peebles,	1862
	Kerr, William,	Beith, Ayrshire,	1861
	Keyes, H. O'Sullivan,	Limerick, Ireland,	1856

	King, James,	Belfast,	1843
	Kirk, Benjamin R.,	United States Army,	1863
	Kirkby, James,	Sibsey, Lincolnshire,	1856
370	Kirkham, James,	Liverpool, *dead,*	1841
	Kirkham, George,	West Derby,	1843
	Kirkpatrick, John,	Dunscore, Dumfriesshire,	1831
	Knight, James,	Renfrewshire, *dead,*	1839
	Knight, Robert,	Alloa,	1851
	Knox, George,	Haddington,	1846
	Laidlaw, Robert,	Montreal, America,	1840
	Laing, William,	Banchory,	1826
	Laing, Robert,	Carron,	1861
	Lamb, William,	Indian Army,	1850
380	Lambert, James,	Royal Artillery,	1855
	Lambert, Thomas,	Manchester,	1859
	Lambert, Septimus,	Manchester,	1861
	Lang, Robert,	Bridge of Weir, Renfrew,	1858
	Langdon, John,	Launceston,	1854
	Lauder, Charles,	Dumfries,	1830
	Law, James,	Edinburgh,	1857
	Lawson, Alexander,	Bolton, Lancashire,	1842
	Lawson, John,	Manchester,	1837
	Lawson, John,	High Street, Forres,	1851
390	Lawson, William C.,	Bolton,	1864
	Lawson, John, jun.,	Manchester,	1862
	Lawton, Peter,	Alderley, Cheshire,	1862
	Learmonth, Thomas,	Edinburgh, *dead,*	1837
	Leather, Joseph,	Douglas, Isle of Man,	1862
	Lee, John Henry,	Chesterfield,	1857
	Lees, Robert,	Tarbolton, Ayrshire,	1862
	Leith, William,	Alford, Aberdeen,	1834
	Lewis, Walter,	Crewe, Cheshire,	1856
	Lewis, George,	Monmouth,	1861
400	Lewis, John F.,	Hartlebury, Worcester,	1862
	Liddle, John,	Brockholes, Berwickshire,	1833
	Linton, George,	Bishop Auckland,	1855
	Little, Thomas,	Swinefleet, Yorkshire,	1862
	Little, John,	Agusterton, Cumberland,	1863
	Littler, Robert,	Clawson, Leicestershire,	1850
	Livingston, James,	Strathtay,	1827
	Loader, Thomas,	Basingstoke, Hampshire,	1843
	Lockhart, William,	New York,	1849
	Lockwood, G. W.,	York,	1840
410	Lockwood, Noel,	Hull, Yorkshire,	1847
	Lord, Richard,	Halifax, Yorkshire,	1857
	Lord, William C.,	5th Lancers,	1842
	Lothian, William,	Thirlstane, Berwickshire,	1844

	Lowe, Charles,	Redgorton, Perthshire,	1851
	Low, John,	Pittendennie, Perth,	1842
	Low, John,	Marchburn, Kincardine,	1842
	Lyon, John,	Prescott, Lancashire,	1845
	Lyon, William,	Forfar,	1833
	M'Arthur, Alexander,	Largs, Ayrshire,	1863
420	M'Caa, John,	Ayrshire, *dead,*	1844
	M'Call, James,	Glasgow,	1857
	M'Court, John,	Belfast,	1859
	M'Culloch, Allan,	Glasgow,	1862
	M'Donald, James G.	America	1844
	M'Dougal, Alexander,	Old Kilpatrick,	1864
	M'Dougall, James,	West Kilpatrick,	1838
	M'Dougall, John,	Cardross,	1860
	M'Eachran, Duncan M.,	Canada West,	1861
	M'Farlane, Andrew,	Trinity Gask, Perthshire,	1848
430	M'Gregor, Andrew,	Crieff,	1838
	M'Gillivray, James,	Rayne, by Insch, Aberdeenshire,	1845
	M'Gavin, James,	Johnstone,	1848
	M'Gill, John F.,	Ayrshire,	1849
	M'Gregor, John,	Tain, Sutherland,	1850
	M'Intosh, Robert,	Falkirk,	1855
	M'Intosh, Robert, M.D.,	Australia,	1839
	M'Intosh, W., M.R.C.S.E.,	do.	1839
	M'Intosh, Andrew J.,	Dumfries,	1862
	M'Kerrow, Hugh,	Lesmahagow,	1828
440	M'Lachlan, David,	Paisley,	1864
	M'Lae, William,	Dalmuir,	1852
	M'Laren, John,	Newport, Yorkshire,	1863
	M'Lean, John,	Aberfeldie, *dead,*	1826
	M'Lean, John,	Edinburgh,	1837
	M'Lean, John,	Renfrew, *dead,*	1837
	M'Lean, John,	Springburn, Glasgow, *dead,*	1856
	M'Lean, Lachlan,	Dunfermline,	1854
	M'Lean, Daniel,	Royal Artillery,	1861
	M'Kirdy, John,	Kingarth, Bute,	1834
450	M'Millan, Hugh,	Aberfeldy,	1861
	M'Naughton, John,	Langholm,	1836
	M'Naughton, Edward,	Melbourne,	1846
	M'Robie, Robert,	Glasgow, *dead,*	1842
	M'Vean, Robert,	Stirling, *dead,*	1828
	Maginn, Charles James,	Ireland, *dead,*	1847
	Malcolm, John,	Enniscorthy, Ireland,	1863
	Marno, William,	Kennethmount, Aberdeenshire,	1857
	Marshall, Matthew J.,	East India Company,	1853
	Marshall, Thomas,	Glasgow,	1851
460	Marshall, William,	Yorkshire, *dead,*	1844

	Martin, Edward,	Camoyle, Forfar,	1850
	Martin, Henry,	Scone,	1860
	Martin, John,	Limerick,	1842
	Martin, James,	Navan, Co. Meath,	1864
	Mason, John,	Kincardine,	1844
	Mason, Robert,	North Berwick,	1835
	Mather, Thomas,	Edinburgh, *dead,*	1840
	Maxwell, James,	Dalswinton, Dumfries,	1835
	Mayer, William,	Penrith, *dead,*	1846
470	Mechie, Peter,	Wishaw,	1852
	Mechie, William,	Berwickshire, *dead,*	1841
	Mellis, Thomas,	Inverury, Aberdeenshire,	1862
	Mennie, George,	Skene, Aberdeenshire,	1857
	Merry, Charles,	Cumnock, Ayrshire,	1863
	Michie, Thomas,	Australia,	1855
	Midgley, John,	Birkenhead,	1860
	Mills, John,	18th Light Dragoons,	1858
	Millar, George,	Bradninch, Devon,	1845
	Millar, William,	Methven, Perthshire,	1853
480	Milligan, John,	Lockerbie,	1864
	Miscamble, John,	Melbourne, Australia,	1845
	Mitchell, Andrew,	Barr, Ayrshire,	1850
	Mitchell, Graham,	Linlithgowshire,	1854
	Mitchell, Robert,	Glasgow,	1859
	Mitchell, William,	Bathgate, Linlithgowshire,	1849
	Moffat, George D.,	Edinburgh,	1844
	Moir, Charles,	Wales,	1851
	Moir, John,	Banchory,	1855
	Moir, Peter,	Army,	1861
490	Monkman, Mark,	Leeds, *dead,*	1841
	Montgomery, Edward,	Dublin,	1858
	Moore, James,	London,	1837
	Moorehouse, James W.,	New Zealand,	1853
	Morgan, George,	Liverpool,	1856
	Morris, John,	Aberdeen,	1857
	Morris, William,	Aberdeen,	1864
	Morrison, Alexander,	Towie, Aberdeenshire,	1862
	Morton, George,	Edinburgh, *dead,*	1840
	Munn, John,	Ochiltree, Ayr,	1852
500	Murphy, John B.,	Drogheda, Louth,	1846
	Murphy, M. B. J.,	Dublin,	1848
	Murphy, James,	Armagh,	1862
	Murray, John,	Dunse, *dead,*	1830
	Murray, David,	Methven,	1838
	Murray, Peter,	Tulla, Clare,	1844
	Murray, Thomas,	do.	1846
	Murray, William C.,	Portobello,	1844

	Muter, William,	Cape of Good Hope,	1849
	Newton, Peter,	America,	1842
510	Nicholson, Robert,	Womersley, Yorkshire,	1844
	Nimmo, Alexander,	Linlithgow,	1827
	Nimmo, Andrew,	do.	1850
	Nuttal, Edmund,	Bury, Lancashire,	1863
	Ogston, Robert. .	Mill of Calurlie, Aberdeen-shire,	1858
	Olden, George,	Cork,	1845
	Olden, Robert, senior,	do. *dead,*	1839
	Olden, Robert, junior,	do.	1839
	Oliver, George,	Army,	1863
	Ord, Robert,	Roxburgh, *dead,*	1846
520	Ormiston, William,	Mexico,	1837
	Osborne, Joseph,	Spondon, Derbyshire,	1845
	Owles, A. J.,	Staff Veter. Surgeon, Army,	1848
	Paley, David,	11th Hussars,	1859
	Pallin, William,	Carlow, Ireland,	1863
	Parks, Henry,	Liverpool,	1852
	Paterson, Robert B.,	Dumfries,	1840
	Paton, William,	Inchinnan,	1838
	Paton, Thomas,	Cape Mounted Rifles,	1855
	Patterson, Charles,	Hull,	1853
530	Pears, Joseph,	Penrith,	1860
	Pears, Henry,	Walton, Cumberland,	1858
	Peebles, James,	Lochee, Forfarshire,	1860
	Peech, John D.,	Wentworth, Yorkshire,	1851
	Percival, George,	Over Whitley, Cheshire,	1863
	Perrie, James,	Old Deer,	1828
	Pettigrew, Robert,	Carluke,	1847
	Phillipson, Thomas,	Stamfordham,	1836
	Pitt, John Edward,	Birmingham,	1857
	Poett, Augustus J. J.,	East India Company,	1843
540	Poett, John Luke,	Curragh,	1860
	Pollock, Thomas,	Edinburgh,	1842
	Pollock, David,	Bellshill, Lanark,	1862
	Pope, Adam,	Tarves, Aberdeen, *dead,*	1833
	Potts, Leonard,	Penrith,	1859
	Potts, Robert,	Australia,	1837
	Pottie, Alexander,	Renfrew,	1860
	Pottie, Michael,	Strathmeigle, *dead,*	1829
	Pottie, John,	Australia,	1858
	Pratt, Thomas,	Masham, Yorkshire,	1858
550	Prentice, Robert,	Bathgate,	1852
	Preston, James,	Mallow, Ireland,	1860
	Pritchard, Thomas,	Madras,	1851
	Proctor, Thomas,	Liverpool,	1843

	Proudfoot, George,	Eastgate,	1855
	Pugh, Charles G.,	Haverford West, *dead,*	1842
	Purdie, John,	Weston, Lanarkshire,	1833
	Purves, George,	Stirling, *dead,*	1834
	Quick, John Couch,	St Ives, *dead,*	1841
	Ramsay, Henry,	Lumphanan, Aberdeenshire,	1861
560	Rawes, William,	Shap, Westmoreland,	1859
	Reed, Thomas,	Shotley Bridge,	1860
	Reid, Andrew,	Cluny, Fifeshire,	1859
	Reid, Alexander,	Towie, Aberdeenshire,	1857
	Reid, Charles,	Strathardle, Perth, *dead,*	1830
	Reid, Patrick,	Easter-Middleton,	1844
	Reid, Peter,	Stirlingshire,	1844
	Reid, Robert,	Assistant-Inspector of Slaughter-Houses, Edin.	1860
	Reilley, Owen,	Oristown, Ireland,	1860
	Rennie, George,	Elgin, *dead,*	1836
570	Reynolds, Bernard,	Dublin, *dead,*	1851
	Rhodes, John H.,	Manchester,	1864
	Richmond, Robert,	Poppleton, Yorkshire,	1855
	Riddell, Joseph,	Abergeldie,	1827
	Riddell, William,	Garioch, Aberdeen, *dead,*	1833
	Ritchie, Andrew,	Laurencekirk,	1847
	Ritchie, James,	Perthshire,	1838
	Ritchie, Thomas,	Scotland Well, Kinross,	1830
	Robb, Andrew,	Parkhead, Glasgow,	1861
	Roberts, Robert,	Merioneth,	1854
580	Roberts, Thomas,	Lodge, Chirke, Salop,	1862
	Robertson, Alexander,	Stonehaven, Kincardine,	1836
	Robertson, Alexander,	do. do.	1844
	Robertson, Daniel,	Strathey, Perthshire,	1832
	Robertson, James,	Half-pay, Army,	1838
	Robertson, John,	Perthshire,	1844
	Robertson, William,	Kelso,	1852
	Robertson, Adam C.,	Airdrie,	1862
	Robinson, Alexander,	Greenock,	1849
	Robinson, James,	Renfrewshire,	1846
590	Robson, Joseph,	Penrith,	1856
	Romanes, Charles S.,	St Petersburgh,	1807
	Ross, Adam,	Inverness-shire,	1833
	Ross, Andrew Galbraith,	Scots Greys,	1860
	Rowe, H. S.,	Leeds,	1849
	Rowlands, David,	Oswestress, Denbighshire,	1864
	Roy, William,	Crieff,	1842
	Rumney, Oswald J.,	Cumberland,	1857
	Rutherford, Richard,	Calcutta,	1860
	Sandeman, James,	Cortachy, Forfar,	1834
600	Savage, Charles John,	Manchester,	1853

	Scott, George,	Norham,	1859
	Scott, Luke,	Tweedmouth,	1831
	Scott, Strettel,	Dublin,	1859
	Scott, George,	Earlston, Berwickshire,	1861
	Scott, Robert,	Warwick, Roxburgh,	1862
	Scholefield, John,	Pontefract,	1857
	Scriven, George,	Wetherby, *dead*,	1844
	Scriven, William,	Aberford,	1836
	Seaman, Isaac,	Saffron Walden,	1845
610	Secker, Charles,	Knaresborough,	1844
	Secker, Thomas,	Ripon,	1849
	Sermon, George,	Manchester,	1862
	Seton, Henry,	Edinburgh,	1835
	Sharpe, James,	Hamilton,	1850
	Shea, Thomas,	Dublin,	1859
	Shearer, Andrew,	Kirkcudbright, *dead*,	1839
	Shenton, Richard,	Derbyshire,	1855
	Shenton, Thomas,	Bakewell,	1850
	Shepherd, Richard,	Pickering, *dead*,	1856
620	Sheriff, John,	Calcutta,	1854
	Shields, William,	Arbirlot, Forfar, *dead*,	1830
	Shortt, John, M.D.,	Madras, East Indies,	1860
	Simmonds, Benjamin,	London,	1856
	Siddell, Thomas,	Shotley,	1844
	Simpson, Andrew,	Fettercairn,	1860
	Simpson, Cuthbert,	Manchester,	1837
	Simpson, George,	Liverpool,	1842
	Simpson, John,	do.	1846
	Simpson, Thomas,	Ellon, Aberdeenshire,	1864
630	Sinclair, John,	Auchterarder,	1834
	Skea, Joseph,	Aberdeen,	1843
	Slater, James,	Kirkham, Lancashire,	1853
	Smeaton, Alexander,	Crichton,	1834
	Smith, Alexander,	Appletreehall, Roxburgh,	1842
	Smith, Anthony,	Australia,	1834
	Smith, Benjamin,	Ulverston,	1860
	Smith, David,	Fettercairn,	1828
	Smith, Gilbert,	Closeburn, Dumfries,	1836
	Smith, Godfrey,	Darton, near Barnsley,	1860
640	Smith, James,	Inverury, *dead*,	1829
	Smith, James,	Auchterarder,	1852
	Smith, Walter,	Eglinton, *dead*,	1827
	Smith, William,	Redstone, Perthshire,	1841
	Smith, William,	Tranent,	1852
	Smith, William,	Ceylon,	1854
	Smith, Benjamin,	Darton, Yorkshire,	1863
	Smith, John,	Birkenhead,	1864

	Smith, Andrew,	Lecturer on Veterinary Science, Toronto, Canada,	1861
	Snowball, George,	Huntly,	1851
650	Snowball, Matthew,	do.	1853
	Sorely, Robert,	Cromar, Aberdeenshire,	1846
	Soulsby, James Collier,	Hartlepool,	1857
	Spenser, John,	Bakewell, Derby,	1843
	Sproull, James,	Milngavie, Glasgow,	1840
	Spruell, William,	Paisley,	1862
	St Clair, John Pattison,	Lancaster,	1835
	Steel, John,	Biggar, Lanarkshire,	1831
	Steele, John,	Australia,	1862
	Stewart, George,	Banffshire, Rothiemay,	1846
660	Stewart, George,	Perth,	1858
	Stewart, John,	do.	1827
	Stewart, John,	Australia,	1860
	Stewart, Thomas,	Broughty Ferry,	1850
	Stewart, William,	Aberdeenshire,	1824
	Stewart, George,	Penrith,	1861
	Stirling, William,	Ireland, *dead*,	1843
	Stokoe, Thomas,	Hay, Brecon,	1864
	Stone, Harry,	Donington, Leicestershire,	1864
	Storar, James,	The Palace, Dubford, Banff,	1848
670	Storie, Francis,	East Linton,	1827
	Stowe, William H.,	Warwick,	1857
	Strangeways, Thomas,	Lecturer on Anatomy, Edin. Veterinary College.	1857
	Strut, Peter,	Ford Bridge, Northumberland,	1835
	Swarbreck, Thomas,	Preston, Lancashire, *dead*,	1841
	Tait, George,	Meigle,	1824
	Tait, George, jun.,	do.	1848
	Tait, James,	Perthshire,	1857
	Tait, John,	Tweedmouth,	1835
	Tait, John,	Kirkintulloch,	1848
680	Tait, Joseph,	Portsoy,	1861
	Tallontire, John,	Skelton, Cumberland,	1863
	Taylor, Alexander,	Brechin,	1842
	Taylor, Peter,	Manchester,	1844
	Taylor, Thomas,	do.	1859
	Taylor, Walter,	Cheshire,	1857
	Taylor, William,	Australia, *dead*,	1856
	Taylor, William,	Wetherby, Yorkshire,	1859
	Taylor, James,	Co. Down, Ireland,	1863
	Tennant, Charles,	Maybole,	1844
690	Tennant, J. B.,	do., *dead*,	1840
	Terry, William,	Wells, Norfolk, *dead*,	1843
	Teviotdale, John,	Elgin,	1839
	Thomson, David,	Trinidad,	1859

	Thomson, George,	Horncastle, Lincolnshire,	1853
	Thomson, Henry,	Rosyth, *dead*,	1833
	Thomson, Henry,	Aspatria, Cumberland,	1860
	Thomson, John,	Kingswood, Perth,	1833
	Thomson, John,	Glammis, Forfar,	1841
	Thomson, John,	Bridge of Ardrock,	1843
700	Thomson, Robert,	Auchterarder, *dead*,	1828
	Thomson, Samuel,	Corehouse,	1850
	Thomson, Thomas,	Redstone, Perthshire,	1832
	Thomson, Thomas,	Sunderland,	1840
	Thomson, Thomas,	Strathaven, Lanark,	1853
	Thomson, William,	Dunbar, *dead*,	1849
	Tindal, James,	Glasgow, *dead*,	1834
	Towers, J. T.,	13th Light Dragoons, *dead*,	1850
	Tudhope, David,	Lesmahagow, Lanarkshire,	1844
	Turnbull, Archibald,	East India Co., Bengal,	1846
710	Turnbull, Thomas,	Hawick, *dead*,	1831
	Turnbull, John,	Rhynie, Aberdeenshire,	1862
	Turner, James,	Montreal, Canada,	1833
	Turner, John,	Warrington,	1847
	Tuthill, John,	Tralee,	1852
	Unsworth, John Bell,	Manchester,	1856
	Vasey, Nicholas,	Durham,	1856
	Waddell, Alexander,	Perth, *dead*,	1835
	Wagstaff, Samuel,	Leadenham, Lincoln,	1862
	Wainwright, Thomas,	Sherburne, Yorkshire,	1861
720	Waldie, Edward,	Jedburgh,	1840
	Walker, Robert,	Kirkintulloch,	1848
	Walker, Thomas,	Rothley, Leicestershire,	1844
	Walker, William,	Dundonald, Ayrshire,	1829
	Walker, William,	Dalry, Ayrshire, *dead*,	1845
	Walker, Peter,	Luss, Dumbarton,	1861
	Warfolk, Thomas,	Wishaw,	1852
	Waters, George,	Buntingford, Herts,	1845
	Watt, Alexander,	Edinburgh,	1837
	Watt, James,	Edinburgh, *dead*,	1826
730	Waugh, William,	Stirling,	1846
	Webster, John,	Fourden, Kincardineshire,	1862
	Welsh, C.,	Whaley Bridge, Derby,	1863
	West, Richard,	Thetford, Norfolk,	1862
	Wheeler, William C.,	Cairo, Egypt,	1862
	White, James,	Aberdeenshire,	1836
	White, James,	Paxton, Berwickshire,	1835
	White, John,	Waltham, Lincolnshire,	1846
	White, Thomas,	Corwen, Wales,	1861
	Whittle, William,	Manchester,	1848
740	Whyte, William,	Girvan, Ayrshire,	1844

	Whyttock, Alexander,	Perthshire,	1843
	Wilkie, Alexander,	Forfarshire, *dead,*	1831
	Wilkinson, James,	Dundee, Forfarshire,	1844
	Williams, John,	St Asaph,	1845
	Williams, William,	Bradford, Yorkshire,	1857
	Williamson, John,	Dalkeith, *dead,*	1839
	Willett, Wm. Gregory,	Stretton, Cheshire,	1861
	Wills, Samuel J.,	Blandford, Dorset,	1861
	Wilson, Archibald,	Africa,	1838
750	Wilson, George,	Bank House, Edinburgh,	1837
	Wilson, James,	Keig, Whitehouse, Aberdeensh.,	1850
	Wilson, James,	Stirlingshire,	1852
	Wilson, James,	Australia,	1860
	Wilson, John Marshall,	Military Train,	1858
	Wilson, Robert Stretton,	Ollerton, Notts,	1852
	Wilson, William,	Sanquhar,	1862
	Wishart, John,	Melrose,	1832
	Wishart, Philip,	Haddington,	1844
	Womack, John,	Ponteland, Northumberland,	1861
760	Wood, Sampson,	Moor Town, Leeds,	1853
	Wood, William,	Wigan,	1854
	Wordie, John,	Cumbernauld, *dead,*	1843
	Wordie, Robert,	do.	1845
	Worthington, William,	Clinical Assistant, Edin. Veterinary College,	1840
	Worthington, William,	Garstang, Lancashire,	1863
	Wragg, G. Moore,	Doncaster,	1850
	Wright, William,	Tideswell, Derbyshire,	1857
	Wylie, George,	Slewoodfield, Aberdeenshire,	1842
	Young, William,	Noblehouse,	1834
770	Young, Andrew,	Jedburgh, *dead,*	1834
	Young, William,	Lanarkshire,	1832

MEANS OF IMPROVING HILL PASTURES.*

By JAMES SANDERSON, 15 Manchester Buildings, Westminster.

[Premium—The Medium Gold Medal.]

NOTWITHSTANDING the progress British agriculture has made during the last twenty years, it is still in many departments unworthy of an advanced age. Impeded by a dogmatic adherence to old and ruinous customs, many owners and occupiers of British soil must divest themselves of false prejudices ere their efforts can deserve the title of good farming, or be favourably measured with the demands of a population whose food requirements agriculturists ought to meet. In several aspects, indeed, farming is still in a state of nonage, and has yet to undergo rudimentary training. Drainage—the initiatory step to all agricultural improvements—has on two-thirds of the wet soils of Great Britain still to be carried out; the use of lime—the best agent for bringing into action dormant plant-food—is in the southern portion of the United Kingdom practically unknown; while a large area of land under tillage is, from inferior culture, inefficient manuring, and injudicious cropping, so unproductive that it were better had it remained in an original state. With all these shortcomings, applicable to a large area of arable land, it is nevertheless in the agricultural, not in the pastoral department of farming that progress is apparent. The former, taken as a whole, has for a long period been steadily progressing, while the latter has almost remained stationary for centuries. Doubtless in pastoral farming vigorous efforts have been made to improve the breeds of sheep which tenant the mountains, but these efforts have often ended in failures, for frequently, after having incurred considerable loss, the modern farmer has been forced to revert to the breed of sheep he formerly disparaged, and to admit that the practice of our forefathers, which recognised the adaptation of different breeds to different climates, was the correct one. If similar efforts had been directed to the improving of sheep pastures, more successful results would have been obtained; for, apart from increasing the value of mountain pastures, a proper basis would have been furnished for successfully improving the breed of sheep. As it is, all who are acquainted with upland districts must admit that hill pastures have been neglected, and that there are no grounds for believing that our mountains are more fruitful now than they have been for centuries.

Natural pastures are strictly divisible into three classes—viz., enclosed lowland pastures, suited for grazing or fattening cattle; upland pastures, available for a regular system of tillage; and extensive moorlands or mountain pastures, available only for sheep husbandry.

* This Report was written in 1861.

The lowland pastures are of the greatest value, and as they require little outlay in the shape of labour, they yield a larger revenue than the finest tillage land. Uplands eligible for regular cropping, notwithstanding recent triumphs of the plough, still occupy a large area; while those pastures only available for sheep cover one-third of the entire area of Great Britain. It is to the consideration of the best means of improving the last of these that I devote this essay.

Viewed in reference to their extent and the number of sheep they maintain, it is truly unaccountable why the improving of Scottish mountains should have been so long neglected. They contain 13,000,000 of acres, furnish food for 4,000,000 of store sheep, and annually produce wool to the value of nearly £1,000,000.

Yielding such a revenue, it were only reasonable to suppose that all available means have been used to improve the Scottish hills. On the contrary, however, it appears that owners and occupiers consider them perfect in a state of nature, and exempt from that wisely ordained law which enjoins that human effort and skill are essential to the production of human food. Erroneous as are such views, yet at a time when the prices of stock were exceedingly low, and when the supply of native stock was more than equal to native consumption, they might have been advanced with some degree of truth. The changes, however, which the system of farming has undergone during the present century,—the extension of the arable, and, consequently, the reduction of the pastoral area; the great demand for, and long-continued high prices of wool and mutton; the increased facilities which the recent use of artificial foods afford for the early maturing of stock for the butcher—thereby causing an increased demand for store stock,—all combined render the improving of hill pastures more imperative now than formerly, and demand the use of all available means to improve the quality and increase the numbers of our mountain flocks. Besides, the rapidly increasing consumption of this country, consequent on its increasing wealth and rapidly increasing population, furnishes a powerful argument to the British farmer to develop the resources of every description of land. This is especially applicable to pastoral land; for while a deficiency in the supply of native fat stock may be met by foreign supplies, our supply of store stock is strictly native, and therefore can only be supplied by our native mountain herds. No doubt on many arable farms stock is raised as well as fattened, but the latter mode, from the farmer's love of quick returns and the increased facilities he has at command for carrying it out, is in growing favour. The supply of store stock being therefore not commensurate with the demand, should operate as a powerful incentive to the store farmers to ameliorate the condition of hill pasture.

The mountain pastures of Scotland consist of such an infinite variety of grasses, and are so varied in character, that it were almost impossible to enumerate them.

The following may be noted as distinct varieties of mountain soils, which, under different conditions, yield such various grasses :—

1*st*, *Clay*.—This description of soil is often found in large tracts on the lower slopes of hills, on slightly undulating ledges, and on terraces or plains which frequently relieve the rapid declivity of mountains. In such positions the clay has not been abraded from the strata on which it rests, but has been carried by rain from surrounding upland rocks. The produce of this soil is generally rank and nutritive, and is distinguished by a dark green colour. When clay is moderately dry it produces no heaths, but the most fertile grasses—such as *Poa annua*, the fescues, the sweet scented vernal grasses, and white clover. It affords excellent spring, and the best autumnal food, is unhurt by summer droughts and winter frosts, and, on the whole, yields the best pastures and rears the largest sheep of any description of soil. Clay also prevails in basins or hollows, and is frequently deposited in small isolated patches in the outlets of valleys. When surcharged with water and incumbent upon an impervious stratum, it assumes what in Scotland is termed a "boggy" character, and produces coarse aquatic plants, sprett, rushes, &c. In this state it has a thin surface-layer of a peaty character formed out of the decay of its rank produce. A large area of the valleys of Sutherlandshire, a considerable portion of the lower slopes of the border Cheviots, and the greater part of Liddesdale, consist of clay.

2*d*, *Peat or Moss*.—This variety of soil is most erratic in its choice of locality and produce. Here it is in unfathomable masses, crowning the summits of our highest mountains—there generating deleterious vapours in the lowest valleys. In one place it yields short nutritive grasses—in another it manifests itself in broken "hags," deep morasses, shapeless gullies, and in rank worthless heaths. Peat varies in character according to its depth and wetness, and to its deposition on plains, gentle slopes, or rapid declivities. When upon a plain and surcharged with water, rank heaths and tufts—like molehills—of yellow fog (*hypna*) are its chief produce. When less impregnated with surface water and comparatively compact, although in a similar position, it produces some of the earliest and most nutritive of spring plants, such as cotton grass (*Eriophorum vaginatum*), deer-hair (*Scripus cæspitosus*), Alpine grass (*Poa Alpina*), &c. When deposited upon a gentle slope or upon a porous subsoil, and with a consistency and compactness of character, it generally produces short rich green herbage; while on steep declivities, mat grass (*Nardus stricta*) is its prevailing produce. Hills on which peat and clay alternate, yielding here the cotton grass for spring food, there rich green herbage, and again interspersed with short nutritious heaths—such as those on the eastern verge of the Lammermoor range—possess the best fattening qualities. Peat covers a large area of each of the northern counties of Scotland; is

to be witnessed in the most sterile form in the upper ward of Lanarkshire, on the bleak moors of Ayrshire, on the northern confines of the county of Selkirk, and hemming the border counties of Roxburgh and Cumberland.

3d, Dry earthy soil, or "White Land."—This description of land is easily distinguished by its meadow or "lea"-like pastures, and its short thick matting of grasses to the entire exclusion of heaths. It generally lies on the greywacke formation, and from the smoothness of its surface, and verdant appearance of its pastures in summer, is extremely beautiful; yielding no vernal grasses, it is very barren in spring, is easily scorched by summer droughts and injured by naked frosts. The mountain-ranges on the north side of the Tweed, towards the east of Innerleithen, those of Yarrow in Selkirkshire, and of Ewes in Dumfriesshire, almost exclusively consist of this description of soil. As a general rule, stock on this variety of land require extraneous spring food.

4th, Hill loam may be regarded as a mixture of the soils I have noticed. Like peat it varies in character, which may be ascribed to the formation on which it rests, and to its produce. Where heaths are its chief produce, its surface-coating of earth is black, somewhat resembling peat, but more friable in character; where sand forms its principal ingredient, the produce is coarse and tufty, and unpalatable to sheep; while when of a clayey character it yields valuable herbage.

The remaining mountain soils of Scotland partake more or less of the character of the soils I have mentioned, and under varied conditions—formation, deposition, and altitude—yield an infinite variety of grasses. The infertile grasses and stunted heaths that grow on the dark serrated mountains of Argyle; the coarse Alpine plants which vegetate in the dark defiles of Glencoe and on some of the mountain-ranges of Perth; the nauseous moss plants which cover spongy swamps that defy the skill of the land improver; the sered grasses of the splintering slopes of Teviot; the nutritive grasses and clovers which bedeck the shallow yet fertile soil of the unyielding granite in Galloway; and the rich herbage of the upland district of Gala-water, comprise the remaining varieties of Scottish mountain produce.

The means hitherto employed for the improving of hills have been almost exclusively limited to surface drainage and the providing of shelter. The latter improvement has been very imperfectly carried out, and limited to the erection of stone dykes in the form of irregularly shaped "stells" in the most exposed situations. The protection from storms which these afford is very partial and inadequate to meet the shelter requirements of the Scottish hills. The old adage, that "shelter for sheep is half meat," still holds true, and with respect to upland districts still requires to be practically verified. It frequently occurs that sheep are near to plenty of natural food, but being unprotected from the fury of the storm they

cannot partake of it. Benumbed with cold at night, and thus prevented from obtaining food by day, they are reduced in condition at a time when they require the greatest amount of food. Were broad and irregular plantations placed on exposed ridges in close proximity to rough winter pastures, the benefits which would accrue to mountain flocks would be incalculable; they would thus not only be protected from storms, but enabled during the roughest weather to obtain food. But apart from the direct use of such plantations, they would beautify and adorn the upland districts, and in some measure relieve the bleak and barren aspect of the Scottish hills.

Hill drainage has made rapid progress in recent years, and has not only converted coarse into fine grasses, but has proved an effectual remedy in preventing many of the most virulent sheep diseases—such as rot, sickness, foot-rot, &c. Under-draining has recently been adopted in upland districts with great success, and doubtless will soon be universally carried out. Whether viewed with respect to economy or efficiency, sunk or covered draïns are preferable to open drains. The former are not liable to those evils—such as filling up from crumbling sides, the growth of aquatic plants, the treading of sheep, &c.—incidental to open water-courses. But apart from this view of the subject, surface drains on steep declivities involve, by scouring, not only a great waste of land, but often impede the range and cause the destruction of sheep in snow-storms. I shall not enter, however, upon the consideration of the principles of the important questions of shelter and drainage, but will consider the latter operation only in reference to its alleged influence in deteriorating hill pastures, and thereby increasing the loss of sheep in disastrous winters, as I apprehend erroneous views have of late been widely promulgated on this point.

It has been alleged that drainage in many instances has denuded hills of their most valuable spring plants, and that on thoroughly drained farms the loss of stock in adverse winters, such as 1859-60, proved most severe; and further, that by the drainage of bog and bent land the pastures of the former are rendered useless for winter food, and the latter coarse and unpalatable. Admitting that cotton grass, deer-hair, &c., require a considerable degree of moisture in the soils which they tenant, it does not follow that drainage removes the requisite quantity. On the contrary, no drains, closed or surface, will render deep peaty moss—the only character of soil which produces spring plants—covered with a thick sward too dry. The effects of surface drainage, especially on such a soil, are earlier and more nutritious plants, and inaccessible pastures rendered available. The fact, too, that the largest breadth of spring grasses is on the summits of hills, therefore not available to sheep in stormy springs such as 1860, warrants the conclusion that the drainage of mosses does not add to the loss of sheep in adverse seasons. Nor is the effect of drainage otherwise on "boggy" land. For a time, during

the change from coarse to fertile grasses, its effect may seem injurious, but the deterioration is only temporary, as *it* eventually induces richer vegetation. Drainage on boggy land extirpates spretts, rushes, &c.; and white clover, *Poa annua*, &c., spring up in their stead. Rank grasses are succeeded by short thick herbage, and pastures which sheep allowed untouched to seed are now eaten with avidity. But it is alleged that this change is destructive of winter food. The allegation, however, is wholly inadmissible, inasmuch as withered sprett, &c., affords little or no nourishment; and even were it otherwise, from the circumstance of boggy land being flat or in basins, its produce in storms—a time when an abundance of food is essential—is not available. And so also the influence of drainage on moss, whose only produce is bent. At first it seems detrimental, but eventually produces satisfactory results. But apart from these general statements, a comparison of the actual losses sustained in 1860 on drained and undrained land, proves that the alleged injurious effects of drainage are unwarranted. On several *partially* drained farms on the Border Cheviots, and in the upper part of Ettrick, the losses were very severe. Nearly one-half of the flocks "fell," and several "*hirsells*" did not produce as many lambs of both sexes as were equal to their usual "*keeping number*" for stock. Again, on some of the worst drained and mossy farms in Selkirkshire the loss of old sheep and lambs was very great. On the other hand, the highest and best drained farm in Selkirkshire with which I am acquainted, without any extraneous aid, sustained only a trifling loss among old sheep, and had an average yield of lambs. The mosses on this farm are at its highest point, and were not accessible in spring 1860. True, on the dry mural hills of Yarrow very severe losses were experienced, but these could not be caused by the removal of spring plants by drainage, for drainage could not denude those hills of that which they did not possess. The truth is, the severe loss in 1859-60 was caused by an early and severe winter succeeding a singularly unpropitious autumn, and not from the decay of spring plants caused by drainage, as several flocks were decimated prior to any vernal vegetation.

Apart from drainage, there are causes assigned for the deterioration of hill pastures which deserve a passing notice. Singular statements are made by old shepherds relative to farms now sterile and barren, which at one time maintained a large number of sheep, and which early in the season produced lambs and the mothers which suckled them for the butcher. Making allowances for the magnifying power of time, and the inferior mutton used even in the beginning of the present century, there is sufficient evidence to warrant the conclusion that on some farms pastures have degenerated.

By some this degeneracy is attributed to the removal from the soil of valuable ingredients in the shape of mutton, wool, bones, &c., and returning to it no equivalent. Others again ascribe it to the

modern practice of a few farmers giving store sheep turnips in spring; while a third party, ignoring the deterioration of pastures, contend that flocks are degenerating from an over-fineness in the breed. As the latter topic does not strictly come within the scope of this paper, let it suffice to say concerning it that the practice of force-feeding young male sheep, and a continued use of male sheep from the same stock, engenders in their offspring feeble constitutions which are unable to withstand adverse winters. As regards the first reason named for the deterioration of pastures, it is not admissible either in theory or practice. Hill pastures yield so little per acre of the materials named, that the nourishment they derive from the atmosphere, and the soil formed out of their decay, are calculated to improve rather than reduce the condition of the soil. This holds true even as regards rich pastures which yield a large amount of produce per acre, as evinced by the fact that fields under permanent pastures continue to improve for a series of years, although they receive no equivalent for the beef, bones, &c., which they annually yield. Nor is the second reason more tenable; for sheep which get a "feed" of turnips every twenty-four hours, drop on hill land richer excrements than if they were continually depastured upon it. Besides, hill pastures taken as a whole receive little nourishment from the droppings of sheep, as it is only on hill-tops where sheep lie during night, and where their accumulated droppings form a new soil, that their effects can be traced. The old practice too of folding hill sheep on arable land during night, invalidates this reason for the decline of pastures. To none of these causes then must pastoral degeneracy be ascribed, but to the law of decay and death, which sets limits to the periods of existence of all animal and vegetable life. Apart from this natural decay, pastures after a lapse of time are liable to degenerate, from the same plants exhausting the soil of those ingredients on which they feed.

To meet these wants nature furnishes pastures with different species of grasses, which have different terms of existence, and which subsist on different food. Hence, as a general rule, those pastures are most valuable which consist of the greatest variety of grasses; while poor worn-out land is characterised by its yielding few species of grasses. All grasses, however, permanent and perennial though they are termed, after a lapse of time shoot forth feeble roots, their leaves become sered and sickly, and they eventually wither and die. A thick matting of fog or moss soon occupies the newly vacated ground, out of the decay of which a fresh layer of soil is formed, and fitted to support another generation of rich and luxuriant grasses. A similar effect is produced by the same means on old cropped land. Formerly uplands were cultivated with consecutive crops of oats till they refused to yield. In this poor condition they were merely ploughed and left to nature to cover with embryo plants. After a lengthened period a new soil was formed out of the remains of these

plants, which on being again cultivated is capable of producing luxuriant cereal crops. The fertilising qualities of soil thus formed out of decomposed plants is well known by the reclaimer of old cropped land, as it is only when he keeps *it* near to the surface, and does not by a deep furrow bury it beyond the reach of plants, that he can calculate on producing abundant crops. And so with hill land. It is not deteriorating although it is covered with moss and its grasses decaying, but simply undergoing a process essential to its permanent fertility—an interval between exhausted and resuscitated nature—a fallowing for the restitution of vegetable nourishment. According to this view, which I submit is borne out by facts, there is no simultaneous degeneracy of hill pastures, but those on one mountain-range may be improving, while those on a contiguous mountain are degenerating. And here human effort is essential to assist nature in carrying out her ends, and to effect in a short period what unassisted she takes years to accomplish; just as human action is required to sow, reap, and manure, in order to produce food. I proceed then to consider some of the means best fitted to carry this out in connection with the improving of mountain pastures.

1. *To plough patches of land for turnips for spring food, and for sown grasses for summer food.*—Were sheep, like some of the animated creation, deprived of all animation during winter, the provision now made for them would be ample, for on the return of vernal suns they would be as vigorous as when in the wane of autumn they entered on their "winter sleep." As it is, sheep require a full and regular supply of food at all seasons of the year, and if they require more at one season than another, that season is winter, when they are deprived of an average amount of animal heat. The prevailing practice, however, is to make no provision for sheep in winter other than that which nature supplies. The consequences are, that sheep require all the summer months to recover the condition winter deprives them of, so that the existence of mountain sheep consists of an alternation of relapses and recoveries corresponding with the changes of the seasons. Doubtless the use of turnips for store stock has recently greatly increased, especially on farms partly pastoral and partly arable; but as a rule turnips are not grown or used in extensive pastoral districts. Unquestionably turnips are the best home-grown food either for store or fattening stock, and on the majority of farms can be obtained at a comparatively trifling cost. Apart from storms, it is in the months of February and March that the Scottish hills are most barren, and consequently when sheep obtain least food. It is in these months, too, when ewes are great with young, that they require the greatest amount of sustenance, not only for preserving a healthy condition of the mothers, but for insuring a healthy and vigorous offspring; so that hill sheep have least food at a time when they require most. A turnip crop, however, meets those wants hill pastures cannot sup-

ply, and not only maintains but improves the condition of sheep. Store sheep which get turnips ten weeks—from the beginning of February to the middle of April—are amply fed, and from their increased yield of wool and lambs doubly reward their increased consumption. Twenty acres of an average crop of turnips are sufficient to maintain a flock of 600 sheep for the time named, allowing five hours a-day on turnips. There are few hills upon which fields could not be broken to that extent, on different parts, for turnips and grass. The descriptions of land best suited to this purpose are "white land" and dry heath land, as the former is deficient in spring plants, and the latter, when thoroughly decomposed and mixed with lime, is singularly productive of turnips and artificial grasses. Land of either of these classes is of least value in a state of nature, and when free of stones can be converted at little outlay, and on the whole is best adapted for the purpose named. Any description of land, however, with the exception of deep peat, will pay to improve, provided it is free of protruding rocks and stones. The best method of breaking up land for this object is to plough it in winter, summer-fallow and lime it, and sow it with turnips the following season. Time is thus afforded for the proper subdivision of the organic matter in the soil, which is essential to secure a bulky crop. On farms where a sufficient breadth of land cannot be obtained, two turnip crops may be taken in succession with advantage. On regularly cropped land this practice is not commendable; but it is otherwise with newly broken land. I have taken two turnip crops in succession, and while both crops were excellent, the last was better than the first.

The cost per acre of thus producing turnips is nearly as follows:—

First ploughing, ...	£0	15	0
Harrowing, ...	0	2	0
5 tons of lime, ...	3	0	0
Second ploughing (light furrow), .	0	8	0
Harrowing, ...	0	3	0
Ridging, ...	0	3	0
2 cwt. Peruvian guano, . .	1	4	0
Seed and sowing seed, &c., . .	0	4	6
Hoeing, ...	0	4	6
	£6	4	0

This is the total cost of the first crop of turnips, and where two crops are taken in succession the expense, in addition to the above, would be:—

Ploughing, ...	£0	8	0
Harrowing, ...	0	3	0
Ridging, ...	0	3	0
3 cwt. dissolved bones, . .	1	4	0
Seed, hoeing, &c., . . .	0	9	0
	£2	7	0

Making the total expenses of two crops £8, 11s. I have not

charged in the expenses the cost of a temporary enclosure, as it costs very little per acre to enclose a 20-acre field, and as even a temporary fence lasts several years. In exposed situations, and where stones are plenty, the erection of a stone fence rewards the outlay, as it is useful for shelter. It will be observed, on the other hand, that the full cost of lime ought not strictly to be charged against the first crop, as I have done, as lime greatly influences the productiveness of the land to which it is applied for at least twelve years. It is not too high to value the first crop of turnips at £7 per acre; therefore, the value of the first crop alone is equal to the total cost of its production. Comparing the value of two consecutive crops, with the expense of raising them, a margin of £4, 19s. is shown in favour of the grower, allowing 5s. per acre as the original value of the land. So much for the direct value of a turnip crop, apart from its influence on succeeding crops of grasses. The latter indeed cannot be successfully cultivated on newly broken up land, unless the soil is reduced to a minute state of subdivision such as a crop of turnips only can render. Summer fallowing does not even sufficiently reduce soil for grasses, and were it otherwise it were not advisible to dispense with a turnip crop, even when the object sought is the substitution of artificial for natural grasses, as the same expense of raising one crop would raise both, and as turnips are equally as valuable for spring, as cultivated grasses are for summer food. Some improvers of hill pastures do not even approve of summer fallowing, but merely sow grasses on the first furrow after its surface is harrowed and limed. This method, however, is as unsupported by theory as it is unsuccessful in practice, and in no case should be adopted. The organic matter in the soil continues dead and inert; and besides, the wide interstices left between the unreduced furrows increases the injurious effects of summer droughts, and thereby renders the surface merely stripes of dried inverted turf, inadequate for the growth of grasses. Clover and grasses no doubt are generally most luxuriant on a compact soil, but a soil nevertheless whose parts have been reduced to allow the free assimilation of plant food. This compactness, however, is totally different from that which is caused, or rather retained, in a soil from not having its parts disentegrated, or from not having its excrementitious matter available. A thoroughly reduced soil is also as essential for the destruction of natural plants as it is for the developing of plant food; for unless the roots of bents and coarse grasses are separated from the soil, they again revive, and in a short time supplant sown grasses. I recently witnessed a case in point on the highest-lying cultivated farm in Selkirkshire. A patch of land, consisting of a thin surface-layer of moss resting on a clayey subsoil, and at an altitude of 1300 feet, was a few years ago ploughed up and sown down with grasses. No previous turnip crop was taken, and although the land was summer-fallowed and limed, yet in two years after it was sown down

its native grasses prevailed. The union of the two crops—turnips and sown grasses—is therefore essential for the successful improving of hill pastures and the proper maintenance of stock. One acre of grass, sown in the manner described, is worth five acres of land in its original state, and will carry five sheep during summer, while formerly it could not maintain one.

The increased number of sheep that a farm on which grasses and turnips are cultivated is enabled to carry, has also an indirect influence in improving the hill pastures which are left by the plough untouched. Sheep which have a feed of turnips every twenty-four hours eat the coarsest grasses, which, combined with the rich excrements they leave on the land, generates richer herbage. And so also with sheep which have access to sown grass, as they are enabled to eat hill grasses bare, and thus prevent their seeding—so injurious to hill pastures. I occupy 200 acres of hill land that has recently been greatly improved in this way. Previous to the last twelve years it was managed in the usual mode of pastoral farming—the sheep it carried subsisting on its produce without the aid of any extraneous food. It was then very poor fogged pasture, and is chiefly dry "lea" abounding with protruding rocks. During the last twelve years about five times the number of sheep it formerly carried have been run upon it in summer and winter from adjoining fields of turnips and grass. The result is, that the treading of the sheep has almost entirely extirpated the fog. And as the grasses have been eaten close to the ground, and have been well manured with the sheep's droppings, so a rich herbage has succeeded barren pastures. This piece of land is now capable of maintaining three times the number of sheep it formerly maintained.

This method of improving hill pastures must at once commend itself to the practical farmer, and, as already said, there are few pastoral farms on which it cannot be carried out. Adopting two consecutive turnip crops, and going twice over the same ground in a twenty-one years' lease, and allowing, as before stated, 20 acres of turnips annually for 600 sheep, the total quantity of land required to be broken up is only 100 acres. Assuming that 30 scores of sheep require 1000 pastoral acres to maintain them, only one-tenth of the pastoral area is required to carry out this improvement.

2. *Surface Liming.*—Besides the wide pastoral area available for the cultivation of turnips and sown grasses, there is an extensive area of hill land proof against the plough or any implement. The former, indeed, bears a very small proportion to the latter, and is also generally more accessible. Happily, there are also means at command for the improving of the larger area, although it must ever remain unbroken. The application of lime to natural pastures has a most beneficial effect on white lea land, or on all land naturally dry. It tends to extirpate moss, the coarser grasses, and noxious weeds, brings into action the dormant surface soil, and

promotes the growth of nutritive grasses. Several farms with which I am acquainted in the vales of Leader and Gala, in Dumfries and Kirkcudbright, have been recently very much improved by a surface-dressing of lime. Several instances, indeed, have come under my observation of land not worth 2s. per acre having been made, merely by surface liming, worth 12s. The extent, however, to which this improvement has been carried is very limited compared with the wide area eligible for it. On every hill and valley, cliff and dell, there are accessible and eligible tracts of land which would be doubled in value by this means. Like the improvement first noticed, the untouched pastures are by this mode also improved from the extra number of sheep maintained. As the quality of the sheep too is improved in the first instance, so also in the latter, especially if turnips are raised for spring food. I know farms which, without either improvement, carried only an indifferent Cheviot stock; but, after having undergone one or both improvements, carry superior half-bred Leicesters, and early mature lambs for the butcher. Not the least weighty argument in favour of liming is that it is executed at a comparatively trifling cost. No ploughing, no enclosures, no seeds; nothing, indeed, but the simple application of lime is required, and barren pastures become fertile. Five tons of lime per acre is a sufficient application, which, at 12s. per ton, only cost £3 per acre; and as an interval of twelve years may be allowed between "doses," so the outlay per acre is trifling compared with the returns. There are extensive tracts of land in Inverness-shire, in Yarrow, in Selkirk, Ewes in Dumfries, and indeed in every county of Scotland, on which lime would produce extraordinary results. As it is, the resources of broad reaches of land in these districts are not half developed, and ruinously withheld, by those who assume to be the custodiers of the people's food, from contributing to the weal of the community. It is truly suprising that farmers act so hostile to their own success. Previous to the introduction of railway accommodation, the want of roads and distance from lime-kilns was, in remote pastoral districts, a plausible plea for not using lime as a surface-dressing. No such plea, however, can now be advanced, as railways traverse nearly every county in Scotland, and afford ready communication with nearly every hitherto secluded valley. As yet the benefits which railways afford for carrying out this improvement have not been taken advantage of; but it may be safely predicted that ere long the use of lime will be an additional source of revenue to railway companies as well as pastoral farmers, by adding to the traffic of the one and increasing the produce of the other.

3. *The enclosing of patches of land for hay for winter food.*—This is not strictly a means for improving pastures, but it is so interwoven with the proper management of pastoral farms that it cannot be overlooked in this paper. It will be observed that the

improvement last mentioned—viz., the liming of pastures—improves spring and summer herbage, but does not improve the quality or increase the supply of winter food. And so also with sown grasses. In a genial spring, and during summer, they are vastly superior to natural grasses; but in winter, whether during a naked frost or a moderate snow, they are less valuable than the coarsest natural pastures. Turnips, too, the most valuable winter or spring food, may, by a severe frost—such as occurred in winter 1859-60—be totally destroyed, or by a deep snow be made unavailable; so that the farmer, to make proper provision for severe winters, and for the proper management of his flock, must have other food resources than those I have commended. Since the introduction of artificial foods, there are many resources that the farmer can draw upon, such as corn-cake, bean-meal, lentils, &c., all of which have been advantageously used in severe winters. These foods, however, are so expensive, and their use involves a system of management so hostile to the natural habits of mountain sheep, that they should only be resorted to in extreme cases, and used only as auxiliaries.

Mountain hay is the most readily obtainable farm produce. Doubts may be entertained by some of the eligibility of many farms for turnips or sown grasses, but all store-farmers will readily concede that there are very few farms not eligible for raising hay. Ready as are the means and wide as is the area through which this valuable product may be obtained, its cultivation is nevertheless, by the majority of store-farmers, neglected. A severe winter may for a time direct increased attention to its production, but the return of a continued course of favourable seasons makes farmers forget that a severe winter may again recur; so they husband no resources to meet it. Thus in winter 1859 owners of large flocks were entirely destitute of hay, which, in conjunction with an almost unprecedented scarcity of straw, and an unusual barrenness in hill pastures, caused the greatest amount of destitution among flocks which received no extraneous support. To obtain the latter, and with the view of arresting the losses among sheep, farmers, at an enormous price, and frequently when too late, bought inferior hay from foreign shores. This extremity was the result of a sadly perverted policy; for if they had directed attention to their own resources, they would have procured sufficient and superior hay, without cost, on their own farms. There are no barriers to the growth of this product. Distance from markets does not operate against it, nor does the absence of roads impede its cultivation, but the most remote valley and secluded glen are as suitable to its growth as the inland meadow.

The method adopted of raising and securing hay by the few Scottish store-farmers who grow it, is exceedingly primitive, and commands less skill and attention than any department of pastoral farming. With the exception of a few farmers who have enclosed

meadows, hay is generally obtained from unenclosed sheep pastures, and therefore denuded of the most nutritive grasses. Hence it consists only of withered sprett, rushes, &c., devoid of nourishment, and only eaten by sheep when impelled by hunger. On the other hand, when hay is grown on land enclosed for the purpose, and properly secured, it is as nutritious as summer pastures, and is eaten by sheep in a black frost, or in a barren spring, with avidity. I have seen, in the south of England, sheep prefer hay—green and fragrant with the abundance of nutritive sap it contained — to luxuriant young grasses and clovers to which they had access. Hay thus secured would be a valuable boon to mountain sheep in any winter, mild or severe; for frequently flocks during frosts or rhinds, although unaccompanied with snow, get a "nip of hunger" which impairs their constitution, and from which they never recover. The use of hay would be an effectual remedy for this evil, and not only prevent sheep from deteriorating, but would improve their condition as made up by summer pastures.

The quantity of land requisite to raise hay sufficient to maintain 1000 sheep depends upon the yield of the land apportioned for the purpose, as also upon whether hay is used as an auxiliary or as a substitute for turnips. It may be said generally, that 30 acres of land efficiently manured will yield a sufficient amount of food for the number of sheep named. Estimating the yield per acre at 180 stones, the total annual produce would be 5400 stones. During a severe winter this quantity of hay would not be sufficient, but the surplus quantity of mild would meet the extra requirements of severe winters. A course of consecutive favourable seasons might accumulate a large quantity of surplus hay, but this could be profitably used up with cattle, and the manure derived therefrom would be valuable for maintaining the fertility of the meadows.

The best description of land for this purpose is strong clayey soil, as it generally yields the largest amount of produce. With the exception of heath or moss, any kind of soil, however, is suitable, if deep and well manured. Dry land, liable to be injured by summer droughts, requires early in spring an application of nitrate of soda to force an early and rapid growth. For the purpose of extirpating moss and noxious weeds, and promoting greater luxuriance, all land for hay, whether bog-meadow or dry, requires a dressing with lime every twelve years. The annual application of 15 tons of farmyard manure in autumn is also essential. The importance of every store-farmer saving such a valuable product by means so simple and inexpensive must command universal approval. It requires to raise it little or no outlay, no ingenious scheming or scientific research, and, unlike other farm products, is almost uninfluenced by diversity of seasons as it is by different altitudes.

There are other means of improving hill pastures than those

noticed, such as irrigation, the application of bones, &c., to which I might have directed attention. The former, however, cannot be successfully carried out on unenclosed mountain pastures, unless sheep are removed elsewhere for a time to escape rot, sickness, &c., which irrigation when being executed engenders ; and the latter is so expensive, and not so efficacious as lime, that it is of little practical use in reclaiming hill grasses.

Admitting, then, the full value and importance of the improvements noticed, as evinced by the production of turnips for spring food, artificial grasses and improved pastures, through the application of lime, for summer and autumn food, and well-secured native mountain hay for winter food, what a boundless and inviting field for progress has still to be occupied by the improving store-farmer : here is wide scope for the exercise of his highest powers and resources, whose development is worthy of his most devoted industry. In mineral and manufacturing resources Britain has no rival, and every means that science, skill, and wealth can command are employed for their development. It is not so with the department in which Britain is naturally most deficient—the supply of food, although this is the real and permanent basis of national greatness, and may be obtained by a judicious expenditure of capital. Here human skill is dormant, and speculation, eager and reckless, and often ruinous in other fields, stands aloof from the safest and most profitable of all investments. This is the more unaccountable, when we consider that the general benefits which the improving of land confers afford no room for diversity of opinion—are, in fact, not doubted, but universally admitted. It is keeping much within the limits of truth to assert, that were the improvements I have imperfectly noticed effected on all pastoral land eligible for them, the mountain pastures of Scotland, instead of grazing 4,000,000 of sheep, would graze 10,000,000, would yield more than double the quantity of lambs they now yield, and would increase the annual produce of wool from 14,000,000 to 40,000,000 lb. ; besides, a large number of hill stock would thus be removed from the hills fit for the butcher, which, under existing circumstances, must be fattened on turnips. These inevitable results tell more powerfully in favour of improving hill pastures than any argument, and might well induce owners and occupiers of pastoral land to make their wealth flow into new currents, their industry change its present resort, and to develop their every energy to obtain them ; then, although spongy swamps or unfathomable morasses, as well as the shattered and naked summits of Alpine peaks, remain, as they ever shall, objects of sterility and barrenness, yet their owners shall have the pleasing satisfaction of knowing that they have not been the media of locking up but of developing the resources of every available acre of land.

ON DISEASES OF FOREST TREES.

By C. Y. Michie, Carr Bridge, Morayshire.

[Premium—Medium Gold Medal.]

The Larch (*Larix*) is a tree first in importance amongst the pine tribe, and is entitled to a prominent place in British woodlands. No tree in the forest, where the soil is suitable, pays the proprietor better during a lifetime, and few if any meet with so ready a market and realise so high a price. This and much more may be said in favour of the larch even under the present existing system of management; but were the habits and history of this most valuable tree more thoroughly understood and better known, it would yet stand in higher estimation than it has hitherto done.

In respect to the various diseases to which the larch is subject, almost every person can say something. It is not my present purpose to endeavour to confute all or any of the supposed causes of disease, but briefly and as plainly as possible to state what I have learned from personal observation in the woods and forests, saw-mill and timber-yards, the seed-room and nursery-ground, as well as in the drain, ditch, and quarry-pit.

I shall first endeavour to describe the general aspects of disease as it presents itself in various cases and upon various species of forest trees, and to explain what I conceive the exciting causes of disease, and prescribe a means of cure or prevention as far as I am able.

The first aspect or form of disease in larch I would notice is an excrescence or ulcer formed upon the trunk of the tree. This appears upon the larch in some cases when the trees are quite young. I have seen thousands of trees thus affected when under eight years of age. It generally makes its appearance in the tree at that part where the branch becomes dead upon the trunk. The branches are decayed to a certain height upon the bole of the tree; between this and where the branches are vital, the ulcer is formed.

On strong clay land where the herbage is rough, and the ground naturally wet, the excrescence or ulcer is usually formed about eighteen inches above the surface of the ground. This form of disease I consider is caused by superabundance of moisture resting upon the foliage and bark of the tree. The first form of this disease is caused by a deficiency of branches sufficient to elaborate and evaporate the sap, while the second form of the same disease is caused by a continuous dampness upon the herbage which surrounds and remains upon the bole of the tree at and to some height above the surface of the ground. This form of disease has some analogy to rust in cereal crops—at least the cause of the one I conceive as nearly allied to the

cause of the other—namely, a want of evaporation during certain stages of the growth of the plant.

Preventive Means.—Keep the trees sufficiently thin upon the ground so as to keep healthy all side branches. This is attained by early thinning when the trees are about 6 feet high, and by proper drainage. When the ground is too wet for larch the drains should be cut 4 feet deep, and at distances of about 30 feet apart, laid with 2-inch socket pipe tiles, and covered in. Tile drains for plantations are often objected to on account of the roots penetrating the subsoil, and ultimately choking them up. My experience in this matter is, that on moderately damp or wet ground newly drained, if the plantation is sufficiently thinned, the trees will so sufficiently develop themselves, and attain so vigorous a state of growth, that the drains will be little if at all affected by the roots getting into the tiles. This I can vouch for as regards pine plantations, but have not had the opportunity of observing the results among hardwood to any extent.

The second form of larch disease I would notice is ground rot. It commences deep in the ground, or in the roots which penetrate the subsoil. The decay commences in the tap-roots, and ascends in the cellular longitudinal tissues of the wood in the centre of the tree, ultimately so far decomposing the heart-wood as to cause it to separate from the sap-wood. When the tree is cut down the part decomposed often falls out in dry brown lumps, leaving the tree hollow in the centre, resembling a wooden pump.

The cause of this form of larch disease is excess of water in the subsoil: the tap roots, after descending some distance, come in contact with water, which destroys the vitality of the roots, as the roots of coniferæ, grown on land subject to ground rot, are soft and porous, unlike those grown on hard ground.

It is difficult to know from external symptoms trees affected with ground rot: the surface of the trunk appears perfectly sound, and no symptoms of disease appear upon the branches, foliage, or fruit. On examining the subsoil, however, and by knowing the age of the trees, the state of matters may pretty accurately be known—whether ground rot is prevalent in the trees or not.

A third form of larch disease is trunk rot, sometimes termed dry rot: it differs from ground rot in two important aspects—first, in the exciting cause, and, second, in the various forms of the disease. The cause of dry rot is in consequence of the tree having exhausted the elements in the soil which constitute its food, the roots from various causes failing to penetrate further into the subsoil, or extend their fibres along the surface of the ground in search of fresh supplies. The life of the tree is in consequence at last terminated. The process of maturing the wood in the trunk of the tree commences prematurely, hence that which under favourable circumstances, and in a healthy tree, would have constituted a bright rich red heart-wood, is in this case a pale bloated yellowish dry substance; nor is the forma-

tion of the heart-wood completed in the same uniform nicely-traced lines along the longitudinal vessels as in the heart-wood of a healthy well-grown tree. This form of disease is easily observable in growing trees; not only do the annual circular rings or layers formed upon the trunk gradually decrease from the time the disease commences in the tree, but the shoots on the ends of the branches fall off in their growth, and the leaves manifest a weak state of health. The tree is unusually loaded with fruit, but the cones are small, and a quantity of the seed unsound.

The ground which is liable to produce this form of disease in larch is a light gravelly subsoil with sandy moss on the surface. The state of the soil, other circumstances being taken into account, determines at what age of the tree the disease will make its appearance, and latterly die.

A fourth form of larch disease is another variety of trunk rot, "in the Highlands termed *roy;*" it differs essentially from the two preceding varieties in every respect. It is known in general that the volatile substances in coniferæ undergo various chemical changes during the growth of the tree and maturing of the wood. Without, however, attempting to explain the causes, or trace the various operations and changes which take place in the substances of which wood is composed, I shall endeavour at once to point out some of the results of those changes, particularly such as present themselves in this instance of trunk rot. The wood of the larch, like that of other trees, is composed primarily of solids and fluids, and these at certain stages of the growth of the tree undergo changes peculiar only to the stage of growth and maturity to which the tree has arrived. When the wood in the centre or round the pith of the tree has undergone that change termed red-wooding, or forming of the heart-wood, the quality of the wood may then be considered to have attained its highest state of perfection, and the volatile or fluid part of the woody matter enters into a fixed state. In this condition the red wood remains for a longer or shorter time "before it undergoes another change," according to the proportion that the volatile properties bear to the solid portion of the wood; in other words, wood rich in quality dissolves its volatile properties at an earlier age than it does under conditions the reverse. I am aware this statement will be questioned by those who have not thoroughly investigated the matter; but it is nevertheless quite true. When the tree in which the last change has taken place is cross-cut with a saw, the part affected somewhat resembles the honeycomb from which the honey has been extracted, or in some cases to a bone that has lain for some time exposed to the atmosphere; in other words, the sound tree resembles the honeycomb full of honey, while the diseased tree resembles the comb despoiled of its sweet contents. This form of disease is less common in larch than in Scots pine, and less common in the plantation than in the natural forest. It differs

from ground rot in this one particular, that the disease is frequently found in the trunk of the tree and near to the top, while the bottom part is perfectly sound, and, *vice versa*, it also sometimes happens that ground rot is found in the bottom of the tree, and roy in the upper part of it.

Fifth, I have frequently found larch trees under thirty-five years of age, when growing in a much sheltered situation and damp soil, infested with a white downy insect. I do not consider the effects of this insect fatal to the tree, as it neither eats the leaves nor breaks the rind; but its presence is an indication that the tree is in an unhealthy state, and by its remaining upon the tree may assist in aggravating the disease. Unless draining and thinning be judiciously applied, trees thus affected will seldom survive over forty years.

Sixth, During the months of May and June I have frequently found young larch considerably destroyed in their foliage by a large brown caterpillar: the effects of this insect are more injurious at this season than at any other time of the year, and the ravages committed are greater when the trees are about 3 feet high, and growing among heath, than when they are higher and growing among soft herbage or on bare ground.*

The silver fir (*Pinus pectinata*) is a native of Europe and Asia, and is a tree highly worthy of attention, and of being more extensively cultivated in Britain, both on account of its use and importance as a timber tree, and also for its pleasing and picturesque effect in the landscape.

The first form of disease I would notice to which this tree is liable is ground rot. This, as in the larch, is occasioned by the tap roots penetrating the subsoil, and thereby coming into contact either with stagnant water or pure gravel, by which means the vitality of the roots is destroyed; and the rot therein begun gradually, and often rapidly, ascends into the lower part of the trunk, sometimes to a considerable height, hence rendering the most valuable part of the tree all but useless. The only successful prevention of this disease

* The various diseases of the larch are here minutely pointed out. Their peculiar manifestations, according to the agents to which they are subjected on different soils and situations, afford an interesting study. With all deference to the views here put forth, we are rather inclined to hold that all the diseases in the larch are traceable to the tree being planted on unsuitable soils. With the exception of drainage, we can do little to render soils suitable to its growth. A soil wet from springs is a healthy one, but from stagnant water is injurious. A *sharp* soil is healthy, a "deaf or douff" one the reverse. In such cases disease seems to be induced in the early stages of the plant by there being a deficiency at hand of those elements of plant-food which determine the formation of rosin. It is the absence of rosin that leads to dry rot, pumping, and other diseases. Like clovers and many other plants, the soil must be chemically suited to the healthy action of the roots to allow it to take up its food in the soil. When Scots fir produces a white and soft wood deficient in rosin, the larch "pumps," or dies out altogether. In certain districts in the south of Scotland the larch is said to die out in some situations where forty years ago it was quite healthy.—ED.

is thorough deep tile-drainage of the soil previous to planting it, and giving the trees when young abundance of room.

The second form of disease in the silver fir I should notice is a white insect, as described on larch, which, in low-lying damp situations, I have seen to such an extent as to resemble hoar-frost. I have also not unfrequently observed this insect on trees on exposed situations when between thirty and forty years of age, when mixed with Scots pine, spruce, &c. In this, as in the case of larch, I do not consider the insect in question the cause but the effect of an already existing disease, which is generally the effect of a too close confinement of the roots and branches by being crowded and confined with other pine trees, or from being situated in a low-lying damp locality. The silver fir should, under all circumstances, have perfect freedom and room for the full development of root and branch; for if the tree is badly rooted, the branches are also imperfectly developed; hence the leaves are rendered incapable of properly elaborating the fluids of the tree, and the vital functions are thereby completely deranged in all their operations. In reference to the presence of this insect on trees on exposed situations, this can only be accounted for by their being too closely confined when young among other trees, as I have frequently seen silver firs, of all ages, when freely and openly exposed, growing at altitudes of above 1000 feet free from all disease and vigorous in growth.

A third form of disease to which the silver fir is liable is cancer in the branches, caused, in most instances, in consequence of the roots coming in contact with moor pan, or into soil already impoverished by the roots of other trees. The cancer or growth is formed during the formation of the young wood in spring. Next season, after the disease commences, the tops of the young shoots die—they become dried and shrivelled up as if singed by fire.

In a year or two after the disease first makes its appearance, the fluids of the tree become so vitiated in the sap-vessels that death to the tree is the speedy result.

This form of disease is also the cause of death to the Balm of Gilead silver fir, and similar to that which affects thorn hedges when planted upon moor, light, and gravelly soil. I never saw this form of disease either in trees or upon hedges growing upon loam or clay land sufficiently dry.

Scots Pine (*Pinus sylvestris*).—The Scots pine in point of usefulness holds a place second only to the larch in British woodlands, but were we to consider all its points of recommendation as relates to Scotland alone, it would probably stand first in the class of forest trees. The Scots pine is undoubtedly the most hardy of coniferæ, and will grow well in altitudes so high, and upon soil so poor, that birch growing up side by side with it forms a mere shrub.

The quality of the Scots pine is much deteriorated by manure, or any other artificial stimulus being applied to it to force its growth.

The poorer the soil and the higher the altitude, the better in quality is the wood, and finer in the grain; but though well adapted to northern altitudes, and thriving on the poorest of soil, it is, notwithstanding, subject to various diseases.

The first form of disease in Scots pine I will notice is ground rot: this disease requires no further explanations here than are given when treating upon the larch. I would, however, remark that plantation timber is much more liable to this disease than trees of spontaneous growth. This can readily be accounted for from the circumstance of each individual tree having sufficient room to develop itself in root and branch on all sides. The pine also in the natural forest strikes root and grows only on hard ground and dry moss of moderate depth. In the plantation, however, the case is very different; the trees are planted regularly over all the ground, whether suitable or otherwise, and there they generally grow up, crowding and obstructing the development of each other, inducing the roots to penetrate deep into the cold and frequently wet subsoil, which is the principal cause of the disease in question, and can only be avoided by planting where the soil and subsoil are naturally either sufficiently dry or rendered so by deep draining.

The second and next form of disease in Scots pine I would notice, is trunk rot, sometimes termed roy. This form of disease, though very prevalent amongst matured old timber in the natural forest, is rarely to be met with amongst planted wood. As this form of disease was fully explained under that head upon larch, I need not further describe it here beyond explaining the symptoms by which the presence of the disease in the tree may be known. The tree in which the disease has existed for a considerable time presents a scaly smoothness of bark; the trunk is generally straight, tall, and clear of branches to a considerable height. Another and sure symptom of the presence of disease is fungi growing upon the trunk, or upon the limbs or branches. Again, a third sign of the presence of disease is a certain hollow sound produced upon striking the trunk of the tree with an axe-head or mall. One important reason why the disease is so much oftener found in natural than in planted wood, is in consequence of the slowness of growth of the former compared with the latter when young, which enables the tree to stand in the forest till much older, not being liable to the general diseases to which plantation wood is liable, or of attaining a state of maturity at so early an age.

The third form of disease I would notice is cancer, or exudation of rosin, which is of two kinds, the first making its appearance upon the trunk, generally about two feet in size; there a mass of rosin collects, usually making its appearance about the latter end of April. The rosin thus collected soon obstructs the sap-vessels, and usually entirely destroys the vitality of the tree about June or July the second or third year.

The exciting cause of this form of disease is excessive richness of quality in the wood, produced by stintedness of growth, which is occasioned by the tree being either imperfectly rooted, or from growing upon soil too hot, such as light sandy moss, or moss resting on moor pan and on pure gravel. Though these sorts of soil produce pine timber of the finest quality, yet in any case where the tree is deficient of roots or side branches the equilibrium of health is easily destroyed by the rosin crystallising in the sap-vessels, and thus causing cancer.

The second kind of cancerous disease occurs near the top of the tree, and at a part where the branches are somewhat thinly set upon the tree, and where the bark is also thin. This form of disease sometimes occurs in the natural forest, but is most prevalent in plantations which have grown up without proper thinning, and where the soil is of a hard and gravelly or rocky nature, with the herbage inclining to heath, but producing wood rich in quality.

The indications which usually manifest themselves where this exudation of rosin is about to take place are, a falling off for several years previous of the growth of the tree at and above where the cancer occurs, and a diminution of branches upon the trunk around and above this part, with a transparency and thinness of bark around the part where the cancer breaks out. The disease commences between the bark and the last-formed layer of wood, manifesting itself by oozing out through the pores of the bark, usually about the latter end of April or beginning of May, and is most common in trees from thirty-five to fifty-five years of age.

The only preventive is judicious and early thinning, particularly upon light hard ground, so as to allow the trees room to develop their trunks, roots, and branches proportionably.

There is yet another kind of cancer to which the Scots pine is liable, and as I conceive it of a different nature from the two forms already described, I cannot refrain from mentioning it here also. This occurs in trees near to the top, and the trees most liable to the affection are those with large, irregular, and wide-spreading tops. The disease, which generally takes place in a large limb, causes that portion above to die, but as generally there are other large branches below where the cancer occurs, one or more of them will form the leader of the tree, and it will continue to grow in apparent perfect health for many years afterwards, and even attain a great age.

The only preventive is to regulate the distance apart of the trees, so as to encourage one single upright trunk of tree, with due size of branches.

The Scots pine is also liable to the attacks of insects, among the most destructive of which is a small, scaly, dark-brown beetle, somewhat resembling the wood-louse; it also attacks others of the soft-wooded pines, such as the Austriaca, Laricia, and Spruce. I have

never observed any silver firs or larch injured by it, owing probably to the hardness of the wood.

The insect perforates a hole in the stem of the newly-formed top shoot or lateral branches; it generally enters the stem a little above where the previous year's growth terminates; from thence it eats its way through the pith of the newly-formed shoot, making its exit either at the base or extreme top of the centre top bud. The greatest amount of damage done is in general during the month of September. The insect remains alive in the tree over the winter. I have found it alive, though in a comparatively torpid state, in the month of February, when the wood in which it was encased was quite frozen. The ravages are sometimes committed upon the young plants in the nursery ground, and I have also observed it upon trees 50 years old. In the latter case I have never seen it except upon the top twigs of the lateral branches,—I have not yet observed it in the leading top shoot of trees over 30 years of age. The leading shoots or twigs perforated by the insect in autumn present a withered brown appearance early in summer, and many of them fall off about June; some of the perforated shoots will, however, if the tree is of slow growth, remain upon the tree for several years.

Since I began to observe the very injurious effects of this insect upon pines, I have endeavoured to ascertain whether it has been ever observed by others, and to what extent its ravages have been committed. The results of my investigations, which, however, are comparatively circumscribed, go to prove that the insect is either a comparative stranger in the woods in Scotland, or if it has long been an inhabitant must have been kept in check by some counteracting agency. In connection with these particulars, a fact of no small importance requires to be made known—namely, where squirrels abound the ravages committed by this insect are greatest, and, at same time, where squirrels are most numerous woodpeckers are most scarce. In conversation with a sawyer, a man of observation, a few days ago, he told me that near to a sawpit where he was at work a woodpecker hatched its eggs, and when the young ones were nearly full fledged, he observed one morning a squirrel enter the nest and carry off a young bird; this was again and again repeated by the squirrel till the whole brood were destroyed. It is now pretty generally known that squirrels eat the eggs of wood-pigeons, from which it may pretty safely be inferred that the eggs of the woodpecker and other insect-devourers will share a similar fate. In Strathspey, about twenty years ago, woodpeckers were very numerous—the holes which they burrowed in the trunks of old trees may at the present day be seen in hundreds, while not a single woodpecker is to be seen in the whole forest. About the year 1840 the first squirrels were seen in Duthel Forest, and now they are to be seen in hundreds, and appear on a rapid increase.

The next enemy to the Scots pine I shall notice is black game. Very serious consequences result to young plantations so long as the trees are under 3 feet high, by these birds, during the winter season, picking out the buds of the young plants. This may appear to those who have not thoroughly investigated the circumstance a matter of little importance, but it is in reality cutting off a year's growth from the top of each plant thus disbudded by game. On making several minute examinations of young plantations of late years, in order fully to satisfy myself of the extent of this evil, in all the pine plantations in Scotland which I have examined for this purpose, the smallest number of plants disbudded are 15 per cent, and the greatest number 75 per cent. The plantations examined were generally from 2 to 5 years planted, but I consider the effects of game greatest about the third or fourth year. At that time there is considerable cover for game; the plantation being also quiet is an inducement for it to remain there, and at same time the birds are conveniently within reach, while they also probably possess greater attractions at that stage of growth than at any other period.

During the months of May and June I have occasionally found Scots pines from 2 to 6 feet high stripped of their leaves by the brown caterpillar; but as these are of rare occurrence, and the injuries sustained so trival in comparison with others, I consider it unnecessary to enter into particulars.

The next and greatest of all enemies to the Scots pine, and by which more real injury is inflicted upon the tree than by any other agency with which I am acquainted, is the squirrel. The injuries are at once incurable, and the extent to which they are committed in Scotland is indeed alarming.

About the month of April, the squirrel, in order to reach its desired food, peels off the bark from the trunk of the tree generally within a few feet of the top. The bark is peeled off with the teeth of the squirrel in shreds about ½ an inch broad, and generally from 3 to 4 inches long. The part upon the tree where the bark is peeled off frequently goes right round; in other cases a square piece is neatly peeled off, as if neatly performed with a sharp knife. The squirrel does not devour the bark, but peels it off that it may regale itself with the saccharine matter contained between the last-formed wood and the bark. It is most active in hot, dry weather, and usually in the morning a little after sunrise, or after a warm shower of rain. The age of the tree which the squirrel prefers for peeling is usually from 15 to 25 years; it prefers the smooth, clean part of the trunk after it has shed its leaves, and selects the most healthy and vigorous-growing trees, and will seldom attack trees of sluggish or stinted growth or in any way diseased unless pinched with hunger. The bark on being peeled off the pine-tree does not again close up and the wound heal as in hardwoods, in consequence

of which the sap, though allowed to ascend in the inner layers of the wood and thus reach the extreme top of the tree, is nevertheless entirely obstructed in its descent, hence that portion of the tree below where the bark is peeled off from that time ceases to enlarge, except what is elaborated by the few remaining branches below the wounded part.

Though the Scots pine is undoubtedly the squirrel's favourite for food, yet in dry warm seasons it attacks, indiscriminately, the larch, silver fir, spruce, and even poplars. The greatest amount of damage done to trees is by peeling off the bark during spring and early in summer, but in districts where the pine sows itself, the loss sustained by the squirrel devouring the seed is very considerable. The squirrel also destroys the young shoots, which causes double tops on trees. It is also fond of acorns, hazel-nuts, haws, the fruit of the briar, and juniper. Since the squirrel became more numerous it has been known of late years to devour eggs, to peel off the bark of decayed trees for the sake of larvæ, and even to rob the woodpecker of its young and devour them. When we consider the enormous amount of property annually destroyed in Britain by squirrels, and the rapidity with which they are increasing in numbers, it is certainly the interest and duty of every proprietor of woods in Scotland to adopt means for their extirpation. The means necessary to accomplish this are very simple. Give liberty to one or more persons of good character upon every estate to shoot them, between the months of February and August—in other words, during the time of the year when game is out of season. Where the squirrels are numerous, I would allow 3d. for each one killed during the first season, 6d. the next, and so on according as the numbers decrease; and in addition to this I would suggest to give an extra annual prize to the person who can produce at the end of each season the greatest number of tails of squirrels killed by himself. Unless these or other effective means be employed for extirpating the squirrel in Britain, we may soon bid adieu to future successful cultivation of pine in Scotland. So far as I can ascertain, the first squirrels seen in Scotland (in the woods at least) were near Dalkeith,—in 1814 a student in the College in Edinburgh shot one there, which he got stuffed, and it was considered a rare curiosity for several years. In 1824 a few domesticated squirrels escaped from a cage at Minto House, Roxburghshire, and they or their progeny were the first seen in the woods in that part of the country. That the squirrel is not a native of Britain appears pretty certain; but where they were imported from, by whom, and at what time, I am unable to ascertain.

The White Pine (*Pinus strobus*) is a tree indigenous to North America, where it occasionally attains a height of 200 feet. In Scotland it thrives best on a fertile open soil, in dry valleys and sheltered situations, and requires perfect freedom in order to develop

its roots and branches. In the county of Perthshire, a few years ago, there were some excellent trees cut down containing upwards of 200 cubic feet, and about 80 feet high. The wood, when cut up and dressed, bears a beautiful clear glossy polish, is of a beautiful white colour and odoriferous smell, and is said to be impervious by worms, hence well adapted for lining wardrobes, making drawers, &c. Its tendency is to grow bare of lateral branches if confined by other trees; and if too much exposed, or grown on very thin poor soil, globules of rosin exude from the bark, and the foliage, instead of assuming that airy, graceful appearance for which the tree is so much admired, is short in the leaves, and presents a blighted, gnarled, and stunted aspect. If, on the other hand, the situation is too damp and secluded, a white downy insect, by some termed the white bug—the same insect as previously mentioned upon larch, silver fir, &c.—infests the tree, the effect of which, so far as I can judge, is to poison the sap, and ultimately to destroy the tree. In order, therefore, to grow the white pine to the greatest degree of perfection in Scotland, in the nursery state it should be well exposed, grown on a free open soil, lifted and transplanted every year previous to planting into the forest, that it may be well rooted and acclimatised. In the forest, when planted, the ground should be well pulverised with the bore-bill several feet round, and to a depth of 2 feet. The situation should be protected from prevailing winds, the surrounding soil quite dry, and the plant, if mixed with other trees, should always stand quite free of them, or if in masses of its own kind, they should be regularly and well thinned out; double tops should be relieved by means of the pruning-chisel whenever they make their appearance.

Having noticed some of the general features, &c., of disease in coniferæ, I shall now endeavour to explain briefly some of the most inveterate forms of disease in hardwooded trees.

First. Dry rot in oak, as generally manifested in vessels built from this tree (though manifested rather in the manufactured wood than in growing timber), may be considered as the result of the oak having grown upon soil deficient in some of the properties necessary to form its fibre strong and perfect, and not, as some maintain, that of oak being cut down and peeled while the sap is in a vital state. On making special investigation on this subject, I find that the same variety of oak, cut from different soils and situations upon an estate, has manifested all the varied symptoms said to exist in trees cut down at different seasons of the year, as in the winter, when the sap is fixed, or in spring or summer, when the sap is in a flowing state. Even those who make use of wood themselves testify that the timber grown on one part of an estate is worth nearly double what the same variety of timber is worth grown upon a different soil, though at the same altitude upon the same estate or locality. Thus it will appear that the soil and climate have much more to do in producing

different qualities of timber than the season of the year in which it is cut, or even the slight difference arising out of the different variety of oak trees.

Second. Among the most common and prevalent diseases incidental to oak is ring-shake, the cause of which is the ground being too cold and wet, or otherwise unsuitable to the healthy growth of the tree. Trees affected with ring-shake are not readily detected by external symptoms; the principal and only indications are dead spray on the ends of the branches, and the newly-formed twigs themselves are of a stunted, unhealthy-like appearance. The exciting cause of ring-shake may with propriety be considered a want of constitutional strength in the tree to enable it properly to mature its heart-wood. The annual layers, in place of adhering compactly together, separate and divide their tissues; and in extreme cases, when the tree is cut down and cross-cut, the wood so completely separates and divides as to resemble a bundle of split lath untied. This disease may be considered as peculiar to old trees, and although frequently found in trees young in years, yet it must be remembered that plants, like animals, frequently become prematurely old by being subjected to climate and soil unfavourable to their constitution.

Third. Sectional-shake is another form of disease to which oak is liable. Unlike the ring-shake, it radiates from the pith to the bark, diverging like the spokes of a cart-wheel, and is occasioned by the tree growing on poor, gravelly, light soil, destitute of a due proportion of clayey earth. The tree affected with sectional-shake is easily observed upon the bark of the trunk,—the bole, instead of being quite round, is generally somewhat angular-shaped, and perpendicular marks are seen upon the bark, as if incisions had been made with an instrument, and the bark again closed over the wound.

The Sweet Chestnut (*Castania*) is peculiarly subject to ring-shake; what takes place with the oak on cold, wet ground occurs to the sweet chestnut upon almost every variety of soil, and in every situation in Scotland,—I might almost say in Britain. Wherever this tree attains to any considerable age, it is considered quite an exception to find a sound tree of it; and this is the more to be regretted on account of the usefulness and durability of the wood. Ring-shake only exists in the matured wood heart-wood, and not in the sap-wood; hence it appears that the disease takes place while the tree is maturing, and not forming its wood.

When we consider that the sweet chestnut is not a native of Britain but of Asia Minor, it will not appear so remarkable that it is seldom if ever found in real true perfection in this country. The maturing of the heart-wood of a tree may in some respects correspond with the ripening of its fruit; for example, the walnut will grow comparatively well in districts where it never ripens its fruit; in like manner, also, the chestnut will grow tolerably well in many places where, from a corresponding constitutional weakness, it is

unable to ripen its wood perfectly. The chestnut grows very fast where soil and climate are favourable: it requires a thoroughly dry rich loam, with an open and deep substrata of decayed rock or sand. It does not thrive well on clay though moderately dry, and is impatient of poor gravel or stagnant water. It requires free, open space for its perfect development of root and branch. The heart-wood in quality is little if at all inferior to oak, and though, in consequence of shake, it is incapable of being cut into boards, yet it may be used to great advantage for beams, lintels, and large scantling.

The Elm (*Ulmus*), of which there are many varieties cultivated in Britain, some for ornamental purposes alone, and others for utility. I shall only mention here two species, the *Ulmus campestris* or English elm, and the *Ulmus montana* or Scots elm.

The English elm thrives under circumstances similar to the sweet chestnut, requires a dry, rich, alluvial soil, and rather sheltered than exposed. This tree, when grown upon a wet subsoil, is very subject to ground rot. The wood is soft, and subject to speedy decomposition when exposed to wind and weather; and in consequence, in case of a branch being broken off, a limb becoming decayed, or from the woodpecker perforating a hole, rot in either case goes on very rapidly: early attention is therefore required in all such cases to dress and paint the wounds. I prefer Archangel tar for this purpose of dressing large wounds in all soft-wooded trees, but for small ones oil paint is generally preferable. A little bird-lime spread upon the edges of any particular hole of the woodpecker is a preventive means, as in consequence of one bird being caught, others will desert the resort.

Smoke is very injurious to the health of the elm, hence the degeneracy of that tree in the vicinity of large manufacturing towns and large cities.

The Wych elm is impatient of stagnant water, and will die in consequence upon ground where oak, birch, and sycamore will grow comparatively well. The elm is subject to shake sectional and ring, to ground rot, staghorn-top, and premature decay. The cause of sectional-shake is similar to that of oak, viz., caused by growing on soil naturally poor and wet. Ring-shake is less common in elm than in many other trees, and is only found existing under circumstances where the tree is constitutionally too weak to mature its heart-wood. Ground rot is caused in a great measure by the tree when young luxuriating in a good surface soil, and afterwards the tap roots entering a poor wet subsoil which rots the roots, causing ground rot in a manner similarly described. Staghorn-top is occasioned by some of the principal roots, after extending themselves for some distance in an agreeable rich soil, coming in contact with gravel, stagnant water, or other deleterious substances; the vitality of the roots is thereby destroyed, which immediately affects the

principal top branches, which in time also decay; but though the leading tops thus die, sufficient small roots remain alive as to preserve the main body of the tree alive.

The general health of the elm is soon injuriously affected by being exposed to ammonia. I have seen excellent trees destroyed by incautiously laying down heaps of farmyard manure underneath them. When the leaves of a tree are destroyed, a host of insects immediately infest the trunk and branches, as may generally be observed upon trees near towns and farm onsteads.

No tree is safer to transplant when large, and has the advantage of being earthed up upon the trunk, as is sometimes necessary to be done in levelling lawns, &c., without injuring the health of the tree. The trunk of the English elm, on being earthed up, produces roots upon the stem; some even affirm that the health of the tree is improved by earthing up.

The Willow (*Salix*).—Some varieties of the willow, as the Huntingdon, often become what is termed staghorn-topped. In this as in all similar cases, the roots which supply the main leading top of the tree come in contact with a substance which either vitiates and poisons the plant, or that part of it nourished through its own class of roots. It is generally believed that each part of the tree is principally nourished through roots peculiarly connected with that part of the tree. Hence it frequently happens that one part of the tree will die through the above cause, and the general health of the tree remain quite sound, unless the circumstance happen to a considerable number of the roots at once, in which case death to the whole tree would be the inevitable consequence.

The only means of cure is through deep drainage of the subsoil in case of water, and at same time to cut off all diseased branches and a portion of the vital wood, allowing new wood to form upon the tree, and which also induces a new class of fibres to strike out upon the roots.

The Ash (*Fraxinus*) is liable to ground and sometimes to trunk rot, and, like the elm, to premature decay. Ring-shake is rarely found in ash, but sectional-shake is quite common to it. It is maintained by some that sectional and ring shake are one and the same disease. This, however, seems erroneous, in so far as I am able to ascertain. Ring-shake arises out of constitutional weakness in the tree, which prevents it from properly forming the heart-wood, while sectional-shake is occasioned by cold and excessive wet, which, though the tree is enabled to mature its wood, there is a want of elasticity in the grain, and which in consequence is probably rent by severe frosts. In some trees there is both sectional and ring shake, and in others only one of them. Ring-shake is often found in trees such as sweet chestnut growing on dry good ground, but I never saw sectional-shake in trees except upon wet cold ground, which I consider shows they are produced by different agencies. The cause of

premature decay is consequent upon the rapidity of its growth when young, upon the roots entering suddenly a poor soil after passing through a rich one, or coming in contact with stagnant water or gravel. Staghorn-tops seldom occur upon trees growing singly, but upon those considerably confined and drawn up, which induces the tap roots to penetrate the cold wet subsoil, as already described under willow, &c. When ash trees under sixty years of age present upon the branches stuntedness of growth they may as well be cut down, as the elasticity of the grain of the wood is already begun to be inferior for purposes where toughness and strength are required. Ground rot is common in ash of considerable age when grown upon land wet in the subsoil, which is caused—as in all other cases of ground rot—by the tap roots decaying, and the rot through them ascending into the trunk in the lower part of the tree.

The Lombardy Poplar (*P. fastigiata*), from the extreme upright habit of its branches, is, as may be anticipated, very liable to ground rot, particularly if growing upon damp soil, and should therefore never be planted near houses, roadsides, or gardens, as it is extremely apt, from its roots being decayed, to be blown down, without previously indicating any symptoms of disease externally.

General Remarks.—On planting trees, in order to maintain health and long life to the utmost degree, the soil previous to planting should in most cases be pitted with trial-pits 5 feet deep, in order properly to ascertain its nature and properties, and the soil in all cases should be drained with close drains to 4 feet deep. Wherever the water-table is within 18 inches of the surface, draining for pine is necessary; and when within 24 inches, draining for hardwoods is necessary, and such species of trees planted thereon as are well known to be adapted to the soil.

Though most forest trees will grow tolerably well upon a variety of soils and under various conditions, yet in order to grow them to the highest possible degree of perfection, and maintain them in health to what in each one may be considered old age, it is necessary that each individual tree be allowed to grow according to its own natural habits, under laws peculiarly relating to itself. It is, however, with arboriculture as it is with agriculture, the crop or plant is not allowed to grow under its own law of nature, but according to a certain rule of art; hence it may truly be said that trees are cultivated for artificial purposes, and not to fulfil the special demands of nature's laws.

It is not enough in our day to know how a tree ought to be grown in order to bring it simply to a state of perfection, so as to answer the end which nature has simply in view; but we must know also how a threefold object is to be attained in the cultivation of forest trees.

First, It is required to grow each species and variety of trees to such degree of perfection as its own natural habits will admit of.

Second, It is required to grow each tree so as to fulfil the pur-

pose in art to which it is intended the tree should be afterwards applied.

Third, It is required to grow or cultivate each tree in a manner and under such a system as to yield the planter the highest possible percentage for the money expended in planting, and the highest possible rent for the ground the tree occupies during its growth.

The season of the year at which an already existing disease in trees, particularly hardwoods, manifests itself, is during the month of September, while pine diseases are most readily discovered in August. When a hardwood tree is diseased, it manifests itself in the tinge which the tree or branch assumes at that season, while the surrounding trees in health are yet quite green. When a disease exists in the vital parts of pine, it shows itself most distinctly when the young wood is beginning to mature itself.

The cancerous diseases in pine are most readily observable about the latter end of May; but in truth all diseases formed through the sap vessels may be considered to commence early in spring, though they do not manifest themselves till later in the season.

FIELD EXPERIMENTS ON THE ACTION OF URIC ACID AS A MANURE.

By THOMAS ANDERSON, M.D., F.R.S.E., Chemist to the Society.

(*Continued from page 429.*)

EXPERIMENTS ON WHEAT.

THE experiments on wheat were made by applying the manures as a top-dressing in the month of April, and in this case the quantities used being smaller than in the turnip experiments, it was thought unnecessary to have more than two sections, to the first of which guano was applied at the rate of 360 lb. per acre, or rather more than 3 cwt., and to the second 180 lb., and the other manures were mixed so as to give the same quantities of nitrogen in every instance, and all the precautions described under the turnip experiments were observed in applying them. The effect of the different manures began to make itself manifest soon after their application, those which contained nitrogen producing a more rapid progress than those which received only the guano ash; and, what was rather unexpected, the plots to which uric acid had been applied showed at one stage of their growth a decided superiority to the others—a superiority, however, which they did not retain at the end of the season. When the crop was ripe, the produce of each plot was carefully reaped, the hand being run along the wire by which it was bounded, so that every straw belonging to it was harvested, and the whole was made into two sheaves, which were set up to dry in the usual manner; and when they were ready to be carried, a large bag was drawn over the top of them as they stood, and the whole was thus preserved without the slightest risk of loss. When ready for thrashing, the sheaves were weighed and thrashed in the ordinary thrashing-machine, the lower part of which was removed and replaced by a large sheet, into which the grain and chaff fell, and they were afterwards separated by fanners, and the weight of grain, chaff, and straw being separately determined, were found in all cases to correspond very closely with the total weight as ascertained by the first weighing, which therefore formed an admirable check on the accuracy of the results.

TABLE IV.

TABLE IV.—FIELD-PLAN of the EXPERIMENTS on WHEAT, showing the Position of the Plots, the Manure, and the Amount of Produce in lb.

		Column AB corrected.	Actual Results.		
			A	C	E
Section 1st, manured at the rate of 360 lb. guano.		U 3.	U 3.	A 2.	N 1.
	Grain, ...	25.54 lb.	29.80 lb.	20.82 lb.	18.73 lb.
	Straw, ...	45.43	53.00	35.30	33.30
	Chaff, ...	8.25	9.63	6.35	6.13
	Total, . .	79.22	92.43	62.47	58.16
		N 6.	N 6.	S 5.	C 4.
	Grain, ...	18.37 lb.	21.43 lb.	25.73 lb.	25.01 lb.
	Straw, ...	33.86	39.50	43.40	41.90
	Chaff, ...	4.80	5.60	7.58	8.21
	Total, . .	57.03	66.53	76.71	75.12
		N 7.	N 7.	A 8.	U 9.
	Grain, ...	17.19 lb.	20.06 lb.	17.53 lb.	24.33 lb.
	Straw, ...	30.60	35.70	32.10	40.00
	Chaff, ...	5.28	6.16	4.67	9.63
	Total, . .	53.07	61.92	54.30	73.96
		C 10.	C 10.	S 11.	N 12.
	Grain, ...	24.86 lb.	29.00 lb.	23.73 lb.	18.30 lb.
	Straw, ...	38.57	45.00	38.20	30.30
	Chaff, ...	7.22	8.42	7.64	4.53
	Total, . .	70.65	82.42	69.57	53.13
Section 2d, manured at the rate of 180 lb. guano.		U 15.	U 15.	A 14.	N 13.
	Grain, ...	20.79 lb.	24.24 lb.	17.30 lb.	17.01 lb.
	Straw, ...	37.70	44.00	28.50	29.10
	Chaff, ...	6.55	7.64	4.09	5.14
	Total, . .	65.04	75.88	49.89	51.25
		N 18.	N 18.	S 17.	C 16.
	Grain, ...	17.57 lb.	20.50 lb.	19.61 lb.	17.36 lb.
	Straw, ...	30.26	35.30	35.00	31.90
	Chaff, ...	5.01	5.84	6.83	6.00
	Total, . .	52.84	61.64	61.44	55.26
		N 19.	N 19.	A 20.	U 21.
	Grain, ...	16.04 lb.	18.71 lb.	14.86 lb.	18.91 lb.
	Straw, ...	28.03	32.70	26.40	33.60
	Chaff, ...	4.95	5.78	4.50	6.23
	Total, . .	49.02	57.19	45.76	58.74
		C 22.	C 22.	S 23.	N 24.
	Grain, ...	17.14 lb.	20.00 lb.	16.26 lb.	16.71 lb.
	Straw, ...	31.11	36.30	31.30	28.90
	Chaff, ...	5.88	6.86	6.02	4.04
	Total, . .	54.13	63.16	53.58	49.65
			B	D	F

In examining the column headed "Actual Results" in this table, we are immediately struck by the discrepancies in the amount of

produce yielded by the different plots, which are so great and apparently so anomalous, that the first impression derived from them is, that no reliance can be placed on the results, and that they ought to be entirely discarded. A more minute examination, however, shows that these differences are capable of explanation; and, in the first place, it is especially to be noticed that in every case the produce on the line AB is considerably higher than on either of the others. When this fact was observed, Mr Thomson called to mind the fact which had been previously overlooked, that in 1859 an experiment had been made on this field in which farmyard manure was contrasted with street manure, and the boundary of the two large plots to which they were applied was exactly in the line separating AB from CD, as could still be determined from the fact that it was marked out by two trees growing in the hedge, so that in 1859 the line of plots from A to B had received a liberal supply of good dung, and the others only the inferior street manure, and there can be no doubt that it is to this that the superior produce of the first is due. A critical study of the table shows that in every instance the plots on the line AB show an average excess of produce over that of the corresponding plots on the other lines of almost exactly one-seventh of the whole; or, in other words, had it not been for this disturbing cause, the produce of the line AB would have been less by this amount than it actually was. It follows therefore that, in order to admit of comparison, the results in that line should be diminished to this extent, and that has accordingly been done in the column marked "AB corrected." This correction, however, does not do away with all the anomalies, for it will be observed, that when the results from top to bottom of the plan are examined the produce steadily decreases. This is particularly obvious when the Nothing plots are examined, the produce of which, arranged as they stand in the field-plan, going from above downwards, is as follows:—

Grain.	Straw.	Chaff.
18.73	38.30	6.13
18.37	33.86	4.80
17.19	30.60	5.28
18.30	30.30	4.53
17.01	29.10	5.14
17.57	30.26	5.01
16.04	28.03	4.95
16.71	28.90	4.04

In all cases a gradual diminution in the produce is observed corresponding with the slope of the land, which falls gradually; and Mr Thomson knows, from previous experience, that the crop is always best on the lower part of this field, although he was scarcely prepared to find the difference showing itself so distinctly as in these experiments. For this variation in soil a correction must also be introduced; and on examining the results it appears that, in order to make them comparable with those of the first row, it is necessary to

add to the second one-twentieth, to the third two-twentieths, and so on as we descend towards the bottom of the field. The results then stand as in the following table:—

Table V.—Field-Plan Corrected for the Variations in Soil.

		Actual Results.		
Section 1st, manured at the rate of 360 lb. guano.		U 3.	A 2.	N 1.
	Grain, . . .	25.54 lb.	20.82 lb.	18.73 lb.
	Straw, . . .	45.43	35.30	33.30
	Chaff, . . .	8.25	6.35	6.13
	Total, . .	79.22	62.47	58.16
		N 6.	S 5.	C 4.
	Grain, . . .	19.29 lb.	27.02 lb.	26.26 lb.
	Straw, . . .	35.55	45.57	43.99
	Chaff, . . .	5.04	7.96	8.62
	Total, . .	59.88	80.55	78.87
		N 7.	A 8.	U 9.
	Grain, . . .	18.91 lb.	19.28 lb.	26.76 lb.
	Straw, . . .	33.66	35.31	44.00
	Chaff, . . .	5.81	5.14	10.59
	Total, . .	58.38	59.73	81.35
		C 10.	S 11.	N 12.
	Grain, . . .	28.59 lb.	27.29 lb.	21.04 lb.
	Straw, . . .	44.36	43.93	34.84
	Chaff, . . .	8.30	8.79	5.21
	Total, . .	81.25	80.01	61.09
Section 2d, manured at the rate of 180 lb. guano.		U 15.	A 14.	N 13.
	Grain, . . .	24.94 lb.	20.76 lb.	20.41 lb.
	Straw, . . .	45.24	34.20	34.92
	Chaff, . . .	7.86	4.91	6.17
	Total, . .	78.04	59.87	61.50
		N 18.	S 17.	C 16.
	Grain, . . .	21.96 lb.	24.51 lb.	21.70 lb.
	Straw, . . .	37.82	43.75	39.87
	Chaff, . . .	6.26	8.54	7.50
	Total, . .	66.04	76.80	69.07
		N 19.	A 20.	U 21.
	Grain, . . .	20.85 lb.	19.32 lb.	24.58 lb.
	Straw, . . .	36.44	34.32	43.68
	Chaff, . . .	6.43	5.85	8.10
	Total, . .	63.72	59.49	76.36
		C 22.	S 23.	N 24.
	Grain, . . .	23.14 lb.	21.95 lb.	22.56 lb.
	Straw, . . .	42.00	42.25	39.01
	Chaff, . . .	7.94	8.13	5.45
	Total, . .	73.08	72.33	67.02

I am well aware that any attempt to trace out and to correct the discrepancies in the actual numerical results of field experiments is so far a novelty, and that it has hitherto been customary to leave them just as they were found—a course which is almost unavoidable when large experiments are made. It is only by working on a small scale, and by distributing Nothing plots abundantly throughout the whole of the experiments, that it is possible to obtain data sufficient to enable us to draw any conclusions of value in this way. To some persons it may even appear that in making these corrections we have taken an unwarrantable liberty with the experimental numbers; but, on the other hand, it must be admitted that they render results, which would otherwise be unintelligible, strictly consistent with one another; and as both the original uncorrected and the corrected results are given, any one who prefers them can make use of the former, and draw from them such conclusions as they appear to warrant. It is only fair to say, that it is Mr Thomson's knowledge of the soil and careful study of the conditions of the experiments which has led to the detection of the cause of the anomaly, and rendered it possible to apply the corrections contained in the foregoing table.

TABLE VI.—CORRECTED RESULTS arranged so as to show the Average Produce obtained from each Manure.

	Nothing.			Guano Ash.			Guano Ash and Uric Acid.			Guano.			Guano Ash and Sulphate of Ammonia.			Nothing.		
							Section 1st.											
PLOT, . . .	1	7	Average.	2	8	Average.	3	9	Average.	4	10	Average.	5	11	Average.	6	12	Average.
GRAIN, . .	18.73	18.91	18.82	20.82	19.28	20.05	25.54	26.76	26.15	26.26	28.59	27.42	27.02	27.29	27.15	19.29	21.04	20.16
STRAW, . .	33.30	33.66	33.48	35.30	35.31	35.30	45.43	44.00	44.71	43.99	44.36	44.17	45.57	43.93	44.75	35.55	34.84	35.19
CHAFF, . .	6.13	5.81	5.97	6.35	5.14	5.74	8.25	10.59	9.42	8.62	8.30	8.46	7.96	8.79	8.37	5.04	5.21	5.12
TOTAL, .	58.16	58.38	58.27	62.47	59.73	61.10	79.22	81.35	80.28	78.87	81.25	80.06	80.55	80.01	80.28	59.88	61.09	60.48
Per cent of Grain,	32.2	32.2	32.2	33.3	32.3	32.8	32.2	32.7	32.5	33.3	35.2	34.2	33.5	34.1	33.8	32.2	34.4	33.3
Straw, . .	57.2	57.6	57.4	56.5	59.1	57.8	57.3	54.1	55.7	55.6	54.5	55.1	56.6	54.9	55.7	59.3	57.0	58.2
							Section 2d.											
PLOT, . . .	13	19	Average.	14	20	Average.	15	21	Average.	16	22	Average.	17	23	Average.	18	24	Average.
GRAIN, . .	20.41	20.85	20.63	20.76	19.32	20.04	24.94	24.58	24.76	21.70	23.14	22.42	24.51	21.95	23.23	21.96	22.56	22.26
STRAW, . .	34.92	36.44	35.68	34.20	34.32	34.26	45.24	43.68	44.46	39.87	42.00	40.93	43.75	42.25	43.03	37.82	39.01	38.41
CHAFF, . .	6.17	6.43	6.30	4.91	5.85	5.38	7.86	8.10	7.98	7.50	7.94	7.72	8.54	8.13	8.33	6.26	5.45	5.85
TOTAL, .	61.50	63.72	62.61	59.87	59.49	59.68	78.04	76.36	77.20	69.07	73.08	71.07	76.80	72.33	74.56	66.04	67.02	66.53
Per cent of Grain,	33.2	32.7	32.9	34.7	32.5	33.6	32.0	32.2	32.1	31.4	31.6	31.5	31.9	30.3	31.2	33.3	33.6	33.4
Straw, . .	56.8	57.2	57.0	57.1	57.7	57.4	58.0	57.2	57.6	57.8	57.3	57.5	57.0	58.4	57.7	57.2	58.2	57.7

TABLE VII.—Giving the AVERAGE PRODUCE per Acre obtained from the different Manures.

	Nothing.				Guano Ash.				Guano Ash and Uric Acid.				Guano.				Guano Ash and Sulphate of Ammonia.				Nothing.			
									Section 1st.															
GRAIN, . . .	Lb. 2258		Bush. 37.6		Lb. 2406		Bush. 40.1		Lb. 3138		Bush. 52.3		Lb. 3290		Bush. 54.8		Lb. 3258		Bush. 54.3		Lb. 2419		Bush. 40.3	
	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.
STRAW, . . .	1	15	3	13	1	17	3	8	2	7	3	17	2	7	1	8	2	7	3	22	1	17	2	23
CHAFF, . . .	0	6	1	16	0	6	0	16	0	10	0	10	0	9	0	7	0	8	3	24	0	5	1	26
									Section 2d.															
GRAIN, . . .	Lb. 2475		Bush. 41.25		Lb. 2404		Bush. 40.01		Lb. 2971		Bush. 49.5		Lb. 2690		Bush. 44.8		Lb. 2787		Bush. 46.5		Lb. 2671		Bush. 44.5	
	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.	Tons.	Cwts.	Qrs.	Lb.
STRAW, . . .	1	18	0	25	1	16	2	23	2	7	2	15	2	3	3	11	2	6	0	8	2	1	0	17
CHAFF, . . .	0	6	3	0	0	5	3	1	0	8	2	5	0	8	1	2	0	8	3	19	0	6	1	2

From these experiments it appears that the guano-ash—that is, the mineral matters of the guano when applied alone to the wheat crop—are entirely without effect, the produce where it is used being identical with that of the Nothing plots. In every case, however, the nitrogenous manure has produced a very marked increase in the crop, and little difference exists in the action of the guano, the uric acid, and the sulphate of ammonia. In Section 1st, the guano has produced the best result; then follow the guano-ash and sulphate of ammonia; while the guano-ash and uric acid stand third, but the difference is very small, and less than 5 per cent of the crop between the two extremes. In Section 2d, the guano-ash and uric acid stand first, then the guano-ash and sulphate of ammonia, while the guano itself is third.

The conclusion to which these results therefore lead is, that there is no difference whatever between the manurial effect of nitrogen in the three different forms in which it has been used in the experiments.

It is worthy of notice also that the manures in this case have produced no effect on the relative proportions of grain and straw—differing in this respect from their action of the turnip, on which the nitrogenous manures increased the percentage of tops. It is possible that this difference may be due to the fact that the manures were applied at an earlier period, and had the advantage of the moist weather of May and June.

In considering the general conclusions to be drawn from these experiments, it is necessary to bear in mind that they are the results of a single season of rather unusual character, and that to give them absolute certainty they ought to be repeated on more than one year. No one is more fully alive to the importance of repeated experiments than I am, and I hope to have the opportunity of testing these results by similar experiments next year; but meanwhile we are entitled to point out the conclusions to which those at present before us obviously lead. They appear, then, to establish beyond all doubt that uric acid is capable of promoting the growth of plants, and that, as a source of nitrogen, it is on the whole equal to sulphate of ammonia or guano. It is true that this result is not fully borne out by the turnips; but the peculiarity of the season, and the fact that the crop was sown at an unusually late period, and just at the commencement of the dry weather, which continued for nearly two months, appear to explain in a reasonable manner the superiority of the action of the ready formed ammonia in this case; and there seems little reason to doubt that if it had been sown a month or six weeks earlier the uric acid would have acted as it did in the wheat, on which it proved quite equal to the other substances. As far as the cereals are concerned, therefore, the whole of the nitrogen of guano may be certainly reckoned as if it were in the form of ammonia, and I believe that this is true also for turnips. But, as

already remarked, these conclusions require the confirmation of farther experiments before they can be considered as definitively settled.

I cannot conclude this paper without expressing my thanks to Mr Thomson, without whose kind and active co-operation it would have been impossible to have performed these experiments.

PROCEEDINGS IN THE LABORATORY.

By THOMAS ANDERSON, M.D., F.R.S.E., Chemist to the Society.

I. ON THE COMPOSITION OF THE SEWAGE-WATER AND SOILS OF THE CRAIGENTINNY MEADOWS.

In the year 1851 I published in the 'Transactions' the results of an analysis of the sewage-water with which the Craigentinny meadows are irrigated, made by Mr Taylor. That analysis, not being made from an average sample of the water, does not represent the general value of the substance, and there is every reason to believe it to be above the truth. Another sample has been recently analysed in the laboratory, which proved of considerably lower value than that previously examined, which is given here as a contribution to our knowledge of the sewage, although it is open to the same objection of being collected at a particular time, and consequently having no claim to be held as representing its average composition. An imperial gallon of the water, including both suspended matter and substances in solution, contained—

Organic matter and ammonia,	39.33
Peroxide of iron,	3.92
Alumina,	3.80
Lime,	10.64
Magnesia,	2.34
Potash,	3.20
Soda,	1.23
Chloride of sodium,	19.01
Sulphuric acid,	7.15
Phosphoric acid,	1.68
Soluble silica,	1.21
Insoluble silica,	2.84
Total solids,	96.35
Total nitrogen,	7.22
Equal to ammonia,	8.77

Of this ammonia 7.80 grains were ready-formed, and the remainder was in the form of nitrogenous organic matters, chiefly in suspension. The most remarkable difference between this and the previous analysis lies in the smaller quantities of both ammonia and phosphoric acid; but even these are high as compared with the

quantity found in the sewage of other towns, and with that which would unquestionably be obtained if the sewage were collected both during the day and night.

Although much attention has been paid to the Craigentinny meadows of late years, I am not aware that any analyses of the soils irrigated have ever been made, although it is interesting to ascertain whether they are permanently improved by the sewage or not. I have therefore undertaken such analyses, and I owe to the kindness of Mr Scott, Meadowfield, the opportunity of examining samples of the soils from two portions of the meadows. The soil irrigated is of two kinds: 1st, that in the neighbourhood of Lochend, which is a loamy soil, capable of producing in its natural state excellent crops of all kinds; and 2d, of a perfectly barren sand. The first of these has been longest irrigated, a part of it having been under sewerage for nearly two hundred years, and all of it for at least half a century. The inferior soil lies on the low ground towards the sea, and thirty or forty years since was a barren tract, covered with scanty herbage, full of sandholes, and known by the name of the Figgate Whins.

The two soils are very different to the eye. That from Lochend is a fine black loam, perfectly uniform in its texture, and obviously containing a large quantity of organic matter. The other is a nearly pure sand, on the surface of which is a thin layer of black soil containing a considerable quantity of organic matters surrounding the roots of the grass. The samples for analysis were obtained by digging a hole ten inches deep, and cutting a slice two or three inches thick from the side, and mixing the whole carefully together. The samples were dried at 212°, and contained—

		Lochend.	Figgate Whins.
	Organic matter,	19.28	5.64
Soluble in acids.	Protoxide of iron,	5.22	1.41
	Alumina,	1.38	0.31
	Lime,	0.62	0.53
	Magnesia,	0.26	0.13
	Potash,	0.29	0.12
	Soda,	0.49	
	Chlorine,	trace	trace
	Phosphoric acid,	0.57	0.22
	Sulphuric acid,	0.37	0.05
	Carbonic acid,	1.03	
	Soluble silica,	0.63	0.07
Insoluble in acids.	Peroxide of iron and alumina,	4.58	
	Silica,	65.28	91.53
		100.00	100.02
	Nitrogen, equal ammonia,	0.62	0.26

These results are peculiarly interesting from the light they throw on the differences between the two soils. It is evident, in fact, that the Lochend soil has been greatly changed in its composition by

the action of the sewage, and the quantity of organic matter, and of all the valuable plant food, materially increased. We have not, of course, the means of contrasting by actual analysis the exact composition of the soil before it was irrigated with that it now possesses; but it may be safely asserted, from the known composition of analogous soils, that it would not have contained more than a fourth—certainly not above a third—of the organic matter, ammonia, and phosphoric acid now present in it. There has been produced, therefore, a very marked increase in the quality of the soil, which could only have been brought about by many years' irrigation. The other soil has been much less affected, and may be considered as being still, to all intents and purposes, a sand, which can only be maintained in its present state by the constant addition of valuable matters; and there can be no doubt that if it were left to itself for some years it would revert to its original sterility. It is worthy of notice that though it is usually supposed that the quality of the soil to be irrigated by sewage is a matter of little moment, provided it be sufficiently open in its texture to permit the free passage of the fluid, the experience of Craigentinny does not support this view, for the naturally good soil brings in its irrigated state about £8 per imperial acre more than the inferior sand. Part of this difference may be due to the fact that the Figgate Whins land, being farther from the sewers, gets only the worst part of the sewage, but this cannot explain it entirely.

II. ON THE COMPOSITION OF THE GREYSTONE TURNIP.

Within the last few years a new variety of turnip has been introduced under the name of the Greystone, which has come into extensive use, and is distinguished from all others by the great weight of the crop it yields. I am informed that the produce is usually about one and a half times that of any of the ordinary varieties, and in particular cases has even been twice as great. As it differs so remarkably in this respect from other turnips, it appeared of interest to inquire whether the nutritive value of the bulbs is equal to the average, and I therefore gladly availed myself of the opportunity afforded me by Mr Scott Skirving of examining samples of this variety grown on his farm, and which had produced a very large crop. Mr Scott Skirving supplied me with two specimens, one grown on clay and the other on sandy soil. The bulbs were chosen so as to give examples of the different sizes found in the field, and some of them were of very large size, one having weighed no less than 15 lb. Their specific gravity was low, and, when cut across, their texture was found to be very spongy.

The analysis of the bulbs was conducted in the following manner:—They were first cut into thin slices, from which small portions

were taken for determining the water contained in them, and another and larger portion was dried for subsequent use. A third quantity, weighing about 2000 grains, was reduced to a pulp by means of a grater, the juice expressed, and the insoluble matter having been well washed, was dried, and its weight ascertained. The nitrogen in this being determined, gave the amount of insoluble albuminous compounds by multiplication by 6.25. The total nitrogen was obtained from the dry residue, and the difference between it and the insoluble nitrogen, gave the quantity of that element found in the soluble albuminous compounds contained in the juice. The oil and ash were determined in the usual manner in the dry residue. The results were as follows :—

	Clay.	Sand.
Water,	93·84	94.12
Oil,	0.26	0.34
Soluble albuminous compounds,	0.36	0.56
Insoluble albuminous compounds,	0.20	0.18
Soluble respiratory matters,	2.99	2.32
Insoluble matters, chiefly woody fibre,	1.73	1.96
Ash,	0.63	0.53
	100.00	100.00
Nitrogen in juice,	0.058	0.090
,, in insoluble matter,	0.031	0.029
Total nitrogen,	0.089	0.119

The ash was fully analysed, and gave—

	Clay.	Sand.
Peroxide of iron,	2.01	2.14
Lime,	11.53	9.94
Magnesia,	1.17	1.85
Potash,	32.71	33.67
Soda,	2.02	2.41
Chloride of sodium,	7.20	7.28
Phosphoric acid,	13.08	14.19
Sulphuric acid,	2.19	2.72
Soluble silica,	0.60	0.86
Sand,	1.73	4.19
Carbonic acid,	20.98	19.60
Charcoal,	4.78	1.15
	100.00	100.00

And the results, recalculated after deduction of carbonic acid, sand, and charcoal, were—

Peroxide of iron,	2.74	2.85
Lime,	15.90	13.24
Magnesia,	1.61	2.46
Potash,	45.01	44.86
Soda,	3.15	3.20
Chloride of sodium,	9.72	9.69
Phosphoric acid,	18.03	18.94
Sulphuric acid,	3.02	3.62
Soluble silica,	0.82	1.14
	100.00	100.00

On examining these analyses it is impossible to avoid being struck with the small amount of solid matter contained in this kind of turnip, amounting in round numbers to 6 per cent, so that every 100 tons of them supply only 6 tons of solid nutriment. This quantity is considerably less than in ordinary turnips, which rarely contain less than 8 per cent, and sometimes as much as 10 per cent, of solid matters, the proportion present depending to some extent on the nature of the season, being in general largest in dry years, and smallest when the proportion of moisture is large. The past year having been unusually dry, particularly in East Lothian, where the turnips examined were grown, it may be fairly concluded that the crop generally would be of good quality, and contain less than the ordinary percentage of water. I regret now that I did not obtain samples of some of the commoner varieties of turnips for analysis at the same time with the Greystone, but the importance of doing so did not occur to me at the time; and it is therefore necessary to rely on the general average, which, for white turnips, may be taken at 91 per cent of water, and 9 of solid matters. If this be the proportion, then it follows that the Greystone surpasses in value any other turnip, provided its average produce be more than one and a half times as great; but with less than this difference it offers no advantage. Of course, in all cases such as Mr Scott Skirving's, when the produce was double that yielded by the common varieties, there can be no doubt about its superiority.

In comparing the analysis of the turnips grown in clay and sandy soil, it is interesting to notice that those grown in the latter, though containing a somewhat larger percentage of water, are slightly superior to the others, as they contain a larger quantity of oil and soluble albuminous compounds. The difference becomes more conspicuous when the composition of the dry matter of each is calculated in 100 parts, as is done below:—

	Clay.	Sand.
Oil,	4.02	5.78
Soluble albuminous compounds,	5.84	9.52
Insoluble do.	3.24	3.06
Soluble respiratory matters,	48.53	39.45
Insoluble matters, chiefly woody fibre,	28.15	33.18
Ash,	10.22	9.01
	100.00	100.00

It then appears that the total albuminous matters in the turnips grown in sand is greatly in excess of those in the sample from clay. Looking at the matter in this point of view, we have also an interesting comparison between the dry matter of the turnip and that of oilcake, from which it appears that the former has nearly half the nutritive value of the latter; and hence 100 lb. of the Greystone turnip should be equal in value to about 3 lb. of good oilcake.

SOLUBLE AND INSOLUBLE PHOSPHATES.

By R. J. Thomson, Grange, Kilmarnock.

[Premium—Gold Medal.]

The application of phosphate of lime as a special manure is so recent a practice that its history must still be fresh in the minds of most of the readers of the 'Highland Society's Transactions.' It will be unnecessary, therefore, to lead them again into that pasture field where bones, rough, raw, uncrushed, unfermented, and undissolved, were first applied—to represent the thin, starved-like, bluish grasses first assuming a greener hue, then a yet richer tint, and, latterly, growing in wild luxuriance—and to depict the fortunate farmer's smiling face as he opened his field gate and allowed to enter as many more stock. It will be unnecessary, also, to tell how chemistry stepped in—as she has so often done—and explained why these happy results took place, suggested means by which they might be increased, and pointed to other sources—materials of little value—from which like results might be anticipated; to enumerate the various processes to which these bones have been subjected, from the tedious breaking with hammers, and, latterly, the expeditious crushing with bone-mills, to their digesting with sulphuric acid; and to show how the mountain masses of far-off lands are now, by the aid of science, mechanical and chemical, made important auxiliaries of the British manure-heap.

We shall, therefore, at once proceed to explain what "Soluble and Insoluble Phosphates" are; and to consider, in brief, their comparative merits.

Let us premise, then, that the names "Soluble and Insoluble Phosphates" are not now found in the vocabulary of strict chemical nomenclature, but are merely convenient expressions used to convey in a simple and significant form a familiar idea of the substances which they are designed to represent.

The terms "insoluble phosphates," "bone phosphates," "bone earth," "earthy phosphates," and "ordinary phosphates," used by different chemists in writing out an analysis, are synonymous, and are all meant to represent what is in strict chemical language styled tribasic phosphate of lime ($3\ Ca\ O, PO_5$ according to the old notation), or triphosphate of calcium ($Ca_3\ PO_4$ according to Gerhardt's unitary notation). We have adopted the latter notation in the following explanations; we trust they will be readily comprehended by every reader who has the slightest acquaintance with but the most fundamental laws of chemical affinity—who but knows that all ponderable bodies are composed of a few simple substances called elements, combined in certain definite proportions; that the

names of these elements are represented by alphabetic letters, and the proportions in which they combine, by ciphers.

Phosphoric acid is composed of three equivalents of hydrogen, one of phosphorus, and four of oxygen: its chemical formula is, therefore, H_3, P_1, O_4; but the figure 1 not being used in algebraic formulæ, it becomes simply H_3, PO_4. It is a tribasic acid; that is, either one, two, or all of its equivalents of hydrogen may be replaced by an equal number of equivalents of metal, thus forming various phosphatic salts, each having properties peculiar to itself. Let us suppose that the hydrogen is replaced by the metal calcium. We might have:—

Either Ca, H_2, PO_4 mono (one)-phosphate of calcium.
Ca_2, H, PO_4 di (two)-phosphate of calcium.
Or Ca_3, PO_4 tri (three)-phosphate of calcium.

Now this last salt—the triphosphate of calcium or tricalcic phosphate, is just our "insoluble phosphate." It exists abundantly in bones, in all varieties of guano, and in some minerals—particularly in those known as apatite, phosphorite, coprolites, and others. It is an insoluble (in water) compound, and of no direct use as plant food till its solution is effected. This gradually takes place after it is cast into the soil, owing to the solvent action of the soil's acid constituents. And the more minutely its particles are broken—such as crushing bones into bone-dust, or grinding coprolites—the more evenly and intimately these finely comminuted particles are mixed with the soil, and the better that soil is drained and "smashed up" by deep cultivation, aërated, in a word, the more rapidly will its solution be effected. But, at the best, this is a process of time; and here it is that chemistry steps in and informs us that we need not wait on a process so slow, that by digesting our "insoluble phosphate" with sulphuric acid we may accomplish its solution artificially, and thus supply our plants with that food when they most require it. This process of digestion is exactly what constitutes the manufacture of "superphosphates"—a term used to denote a manure containing a large percentage of "soluble phosphates."

But what change takes place in this process of digestion? What *is* "soluble phosphate"? The methods of chemical analysis, though giving with accuracy the proportions of the elements in any compound, do not always reveal the manner in which they are combined with one another; and in the analysis of a "superphosphate" it does not appear in what form the phosphoric acid is combined. The monocalcic phosphate (see above) being a soluble salt, it is not unnaturally believed that this is the form of combination in which it exists. The reaction in the process of digestion will be most easily explained by means of the following diagram, to which is added, in order to render it more complete, the combining numbers of the component elements, viz., H (hydrogen) 1; S (sulphur) 32; O (oxygen) 16; Ca (calcium) 20; P (phosphorus) 31.

DIGESTED.		PRODUCTS OF REACTION.
Sulphuric acid, . . .	$H_2 = 2$	
H_2, SO_4* = 98, . . .	$SO_4 = 96$	$Ca, H_2, PO_4 = 117$ monocalcic phosphate.
and	$Ca = 20$	
"Insoluble phosphates,"	$Ca = 20$	
or tricalcic phosphate, .	$Ca = 20$	[anhydrous gypsum.
$Ca_3, PO_4 = 155$, . . .	$PO_4 = 95$	Ca_2, SO_4, = 136 sulphate of calcium or
253	253	253

In writing a commercial analysis many chemists use the term "biphosphate of lime"—a term which, by the way, is not an accurate one, but which has been so long in use, and is so well understood, that it might possibly cause some confusion to alter it.† If we suppose that one equivalent of water (H_2O), in the above diagram, had gone with the sulphate of calcium, the result of the reaction would be:—

Ca, PO_3 = 99 the so-called "biphosphate of lime."
Ca_2, SO_4, H_2O = 154 Hydrated sulphate of calcium, or common gypsum.
253

99 of biphosphate of lime, 117 of monocalcic phosphate, and 155 of tricalcic phosphate, thus each contains 95 of phosphoric acid, and by the rule of proportion the equivalent of any quantity of any one may be easily ascertained. When the term "biphosphate of lime" is used, the quantity of soluble phosphoric acid found in a superphosphate is calculated into that form; but in order to show farmers the comparative quantities of soluble and insoluble phosphoric acid in the manure, it is usual to insert in parenthesis "equal to bone earth rendered soluble," or "equal to soluble phosphates," and the quantity of soluble phosphoric acid calculated as "insoluble phosphate."

The other phosphate of calcium—the diphosphate (see page 492)—is not a common one. It exists in a natural state, however, to some extent in the guano known after preparation as "phospho-guano;" and from this circumstance the preparers of that guano can render soluble the phosphates in it with a less quantity of sulphuric acid,

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* Sulphuric acid is a *bibasic* acid, as its formula ($H_2 SO_4$) implies.

† [The term biphosphate of lime was an accurate expression of the views entertained by chemists at the time it was introduced, but the progress of the science leads to frequent modifications in the names of chemical compounds, and even since Mr Thomson's paper was written a change has occurred in the nomenclature of the three compounds of lime and phosphoric acid, which are now most correctly described as the primary, secondary, and tertiary phosphates of calcium. No chemist, however, thinks of introducing these terms into a commercial analysis; indeed, it is obvious that the attempt to secure theoretical accuracy of *name* would lead to constant changes most perplexing to the non-chemical public, and productive of endless difficulties and disputes.—THOMAS ANDERSON.]

and therefore have less gypsum in it than in any other superphosphate.

We now come to consider the comparative merits of the various calcic phosphates.

The comparative values of "soluble phosphate" from different sources first claims our attention. No experiments of any worth have yet been made to ascertain whether there exists any difference; but soluble phosphate made from bones sells at a much higher price than that from minerals, and this higher price is willingly paid by farmers, who, in general, believe the former to be thus much the better of the two. One thing is certain, "soluble" or monocalcic phosphate is precisely the same substance, both chemically and mechanically, and must be of precisely the same value from whatever source derived. Should continued experiments, conducted with the requisite care to equalise perfectly all the conditions, especially with regard to the various substances applied, yet show, as some are sanguine to believe, that the farmers' prejudices are correct, that the same quantity of soluble phosphate made from bones is of greater fertilising value than that from minerals, it will prove not that monocalcic phosphate differs in value from different sources, but that the soluble phosphoric acid in these manures exists in different forms of combination.

The comparative values of "insoluble" or tricalcic phosphate in different substances depend on the mechanical state of subdivision in which it exists. In a chemical view it is precisely the same compound, whether in bone, guano, or mineral; but the smaller, the softer, and the more porous its particles are, the greater is the surface exposed to the causes which produce solution and the ease with which that solution is effected; the sooner therefore will it become available for plant food, and hence the greater its value.

Guano phosphates are the most easy of solution, then follow those in bones, bone-ash, and minerals in the order here mentioned.

In instituting experiments which have for their object the determination of the comparative values of "insoluble phosphate" in different substances, or of "soluble phosphate" derived from different sources, it is important to bear in mind that there generally are, to some extent, other metals besides calcium in combination with the phosphoric acid—magnesium, for instance, in bones, and iron in coprolites; and that other substances, which may have a beneficial or a deleterious influence on vegetation, are not unfrequently found in considerable quantity in the manures employed, such as fluoride of calcium in apatite. These considerations render it necessary to inquire what influence these substances exercise. Space forbids entering at much length on the propriety of converting insoluble or tricalcic phosphate in every class of manures into soluble or monocalcic phosphate, seeing that the same quantity of phosphoric acid costs three times as great a price in the latter form

as in the former. The monocalcic phosphate is soon *reconverted* into the tricalcic phosphate by the lime, &c., in the soil, and the only advantage of dissolving the insoluble phosphate seems to be that when soluble it gets intimately disseminated in the soil, and when reconverted it must exist in an extremely minute state of subdivision, and probably fit for absorption by the plant. This intimate dissemination and minute state of division must ever be important desiderata in the application of any special manure, so that the tiny spongioles of our plants in search of food may find in whatever direction they go, not a lump here and none there, but in every particle of soil an equal portion.

In experiments in which soluble and insoluble phosphates are compared, the quantity of both left in the soil should be accounted for. Voelcker's experiments have shown that no danger need be apprehended of losing any of even the soluble phosphate by being washed out, unless in very sandy soils. Many farmers prefer a manure in which only half of the phosphates have been rendered soluble, from an idea that soluble phosphate pushes forward the plant in its earliest stages, and that insoluble phosphate carries it on in its latest stages. This may be all quite true; but it has led to the belief, and to action on the belief, that soluble phosphate does no good in the end of the season. Experiments in which the *same* MONEY *value* of two manures from the same source have been applied, the one with all its phosphates rendered soluble, and the other with only half, may, occasionally, apparently favour this hypothesis. There can be little doubt, however, that such a conclusion is erroneous, and the cause is not difficult to find: the manure with only half of its phosphates soluble will contain much more phosphoric acid than the other, the same money value of each being applied, and some of its insoluble phosphates may have become available in the latter part of the season when the phosphates in the wholly soluble manure were probably already used. There is no reason to suppose that the crop on the entirely soluble manure should grow less vigorously in the end of the season than on the other, provided that the same total quantity—and that large enough—of phosphoric acid had been applied in each case. It would be a very interesting experiment, and, considering the enormous quantity of phosphatic manures now used, one of considerable importance, to make trial by lifting a sufficiently large quantity of the crop at different periods of growth.

The granules of even the finest ground *minerals* are so hard and gritty, and the phosphate is dissolved so very slowly in the soil, that the propriety of treating *them*, under almost every circumstances, with sulphuric acid, can hardly be disputed. Very different is it, however, with *bones;* if they be ground into dust, the granules, being porous, are quickly attacked, and rendered fit for absorption in a comparatively short time—say a very few years. *Guano* phosphates are still

more easily dissolved; and it becomes questionable, under many circumstances, whether it might not be more profitable to use them in their natural condition, mixing them, when soluble phosphate is wanted to push a braird, with a quantity of a thoroughly dissolved mineral superphosphate.

Reverting to our diagram, it will be seen, under "products of reaction," that a large quantity of gypsum is formed by the addition of sulphuric acid to tricalcic phosphate; and the question suggests itself, "Might not that substance, or the sulphuric acid it contains, occasion, to some extent at least, the acknowledged superior fertilising value of a superphosphate?" The behaviour (if we may be allowed the use of chemical phraseology thus far) of the various salts used as manures with the constituents of the soil—their decompositions and formation of new compounds—is too occult a science, the very outlines of which are still so much involved in obscurity, to permit one to have recourse to theory in answering this question. We can only call practical experiments to our aid, and beg to submit the following, imperfect as they are.

The object of these experiments is to compare an equal weight of phosphates from each of the great sources—*guano, bones, bone-ash*, and *minerals*—both as soluble *versus* insoluble phosphates, and as guano phosphates *versus* mineral phosphates, &c. The addition of gypsum to undissolved bone-ash, gypsum alone, and sulphuric acid alone, forms another inquiry:—

No. of Plot.	Name of Manure.	Containing per acre					Produce per acre.	
		Soluble Phosphates.	Insoluble Phosphates.	Total Phosphates.	Ammonia.	Gypsum.	Section 1st.	Section 2d.
		lb.	lb.	lb.	lb.	lb.	tons. cwt. qr. lb.	tons. cwt. qr. lb.
1	Nothing, . . .	..	..	..	..	..	16 18 3 0	13 16 2 7
2	Ground coprolites,	..	150	150	14.93	..	16 14 1 14	14 18 1 21
3	Do. dissolved,	88.4	61.6	150	14.93	..	19 13 3 0	17 11 2 7
4	Bone-ash, . . .	..	150	150	14.93	..	16 14 1 14	16 3 1 21
5	Do. dissolved,	107.2	42.8	150	14.93	161.59*	19 18 1 21	17 5 1 7
6	Bone-ash and gypsum, . .	..	150	150	14.93	161.59	18 4 0 7	17 10 0 0
7	Ground bones, .	..	150	150	14.93	..	18 10 1 7	16 2 2 0
8	Do. dissolved,	116.4	34.6	150	14.93	..	19 5 3 21	18 10 1 7
9	Bolivian guano, .	..	150	150	14.93	..	18 16 2 7	17 8 1 21
10	Do. dissolved,	130.2	19.8	150	14.93	..	20 10 3 21	19 2 3 7
11	Sulphuric acid, .	..	..	..	14.93	..	16 12 3 7	17 11 2 7
12	Gypsum, . . .	..	..	..	14.93	161.59	15 4 0 21	17 3 3 0

N.B.—Only half of the above quantities was applied in Section 2d.

Ground coprolites was chosen as the type of phosphatic minerals, and Bolivian guano as the type of phosphatic guanos; a quantity of the latter we dissolved expressly for these experiments, there being no such manure in the market.†

Farmyard manure at the rate of 25 cubic yards (equal to about 17

* It has not been thought worth while to calculate the gypsum in the other dissolved manures.

† Hundreds of tons of dissolved Bolivian guano have been sold *this* season. October 1864.—R. J. T.

tons) per acre was applied on the stubble in autumn on the experiment land. Yellow turnips was the crop grown—sown June 3, singled July 11, and lifted November 2. The quantity of ground bones required to furnish 150 lb. of phoshpates contained nitrogenous matter equal to 14.93 lb. ammonia; as this was the largest quantity it was taken as the standard, and the deficiency in the others was made up by adding sulphate of ammonia. The quantity of sulphuric acid and gypsum applied was made equal to that contained in the dissolved bone-ash. Each plot contained $\frac{1}{6}$ of an acre, and was run across the line of the former ridges. The light manures were carefully weighed first for each plot, and then, just before sowing, for each drill. They were mixed with a quantity of damp sand to prevent blowing, and make them of nearly uniform bulk. The sulphuric acid was mixed with a larger quantity of dry sand. The following is the analysis of a sample of soil taken from six different places in the experiment land:—

Hygrometric moisture,	.86
Organic matter,	10.48
Peroxide of iron,	3.17
Alumina,	10.08
Lime,	1.10
Magnesia,	.15
Potash,	.30
Chloride of sodium,	.70
Phosphoric acid,	.23
Sulphuric acid,	.29
Carbonic acid,	.52
Insoluble silicates,	72.30
	100.18

The following are the analyses of samples of the manures:—

CONSTITUENTS.	Ground Coprolites.	Bone-Ash.	Ground Bones.	Bolivian Guano.	Dissolved Coprolites.	Dissolved Bone-Ash.	Dissolved Bones.	Dissolved Bolivian Guano.	Gypsum.
Water,	1.10	2.18	13.65	6.99	12.40	14.75	17.65	11.01	7.45
Organic matter,*	6.65	5.42	23.85	12.61	17.54	10.90	16.28	17.22	..
Biphosphate of lime,	..	..	..	..	14.29	17.69	15.92	21.31	..
(Equal to soluble phosphates,	..	..	..	..	22.30	27.60	24.85	33.25	..)
Insoluble phosphates,	59.45	73.71	43.70	66.26	15.51	10.85	7.15	5.01	..
Carbonate of lime,	25.75	14.79	12.25	..	..	..	..	..	1.96
Sulphate of lime,	..	..	..	3.24	33.18	41.54	39.76	36.47	89.81
Alkaline salts,†	..	.18	1.55	4.00	3.45	1.50	.89	3.63	..
Sand,	7.05	3.72	5.00	6.90	3.63	2.77	2.35	5.35	.68
TOTAL,	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.90
* Containing nitrogen,	..	..	..	..	..	..	..	..	..
Equal to ammonia,	..	..	4.35	1.27	trace	.13	1.17	.65	..
† Containing phosphoric acid,	..	..	..	2.17	..	..	..	..	..
Equal to tricalcic phosphate,	..	..	..	3.54	..	..	..	..	..

In these experiments we now see faults enough. It is so manifestly

evident that the soil in Section 2d has gradually improved from plot 1 to plot 12,—but to what extent we have no means of ascertaining, from there being only one *nothing* plot,—that the results from it must be entirely discarded. The dissolved Bolivian guano produced the largest crop, and the turnips on it might have been singled a week earlier than on any other of the dissolved manures; but still that proves nothing, for the quantity of its phosphates rendered soluble was greater than of any of the others, and probably accounts for that result. The difference in forwardness of the young turnips at singling on the rest of the dissolved manures was not perceptible; but they were fully a week earlier than those on the undissolved plots, with exception of those on Bolivian guano, which were nearly as early as those on dissolved bones, dissolved bone-ash, and dissolved coprolites. This seems to show both the advantage derived from applying soluble phosphate to the young plant, and that Bolivian guano phosphates are easily rendered fit for absorption in the soil. There was no apparent difference of the plants on the rest of the undissolved manures on the sulphuric acid, the gypsum, and the "nothing" plots.

These experiments would have been infinitely more valuable had the whole of the phosphates in the "dissolved" manures been rendered soluble, and a quantity of each equal to 150 lb. soluble phosphates applied. Their value would have been still further enhanced had the position of the plots been reversed in the duplicate, and had there been at least two *nothing* plots in each set—one at each side. We think, also, that greater accuracy would have been secured had they been made on much smaller plots. Wherever the land is undulating—and it is so over the most of Scotland—and even in many places where it is level, it is almost impossible to get a sufficient breadth uniform in quality for experiments with plots so large as $\frac{1}{20}$ of an acre, if there be many of them. We have come to no conclusion yet what the size should be, but are simply finding our way to it year after year. It may not be out of place to give here our experience so far as it has come: Our first year's experiments were made on plots of the size very often adopted—namely, one acre each; but the results of the duplicates were so conflicting that all had to be thrown aside. We saw at once that this was owing to the soil not proving so uniform as appearances portended, and we resolved, although not without some compunctions, arising from having imbibed popular prejudices without calmly reasoning whether small plots might not give as accurate results as large ones, to try plots $\frac{1}{4}$ of an acre each in the following year. The results of these were consigned to a similar fate; the duplicates would not tally with the others. We then took to $\frac{1}{10}$ of an acre, and had then one, but only one, fit for publication. This year we have adopted $\frac{1}{20}$ and $\frac{1}{30}$ of an acre as the sizes of each plot, but we think this still much too large, and intend next season to work with $\frac{1}{60}$ of an acre or less.

We now see many advantages conducive to accuracy connected with small-plot experiments, which, after further experience, we may take occasion to point out. In the mean time, let all experimenters make every experiment in duplicate at least; a check which, in our view, is *indispensable,* is thus secured.

Before concluding, permit me to acknowledge the kind assistance and very important suggestions which I received, when planning and conducting these experiments, from Professor Anderson, who, although I was entirely a stranger to him, took the deepest interest in every point connected with them, analysed the soil and manures free of charge, and to whom, in short, the greater share of whatever merit belongs to them is due. At the same time let it be distinctly understood that he is by no means responsible for any of the remarks and opinions expressed in this report.

APPENDIX TO REPORT ON "SOLUBLE AND INSOLUBLE PHOSPHATES."

Since the foregoing was written, Dr Anderson has kindly favoured me with the results of the analyses of samples of the turnips grown in the experiments detailed at page 496 :—

No. of Plot.	Name of Manure.	Water.	Albuminous Compounds.	Other Organic Matter.	Ash.	Phosphoric Acid in 100 Parts of Ash.	Nitrogen in Dry Turnip.
1	Nothing, ...	89.25	0.72	9.19	0.84	6.80	1.60
2	Ground coprolites, .	88.48	0.78	9.69	0.85	11.02	1.60
3	Do. dissolved,	90.25	..	..	0.68	..	..
4	Bone-ash, ...	89.56	0.92	9.08	0.54	10.25	1.49
5	Do. dissolved, .	89.76	0.86	8.54	0.84	11.10	1.49
6	Bone-ash and gypsum,	90.79	0.81	7.64	0.76	10.59	1.55
7	Ground bones, . .	88.38	1.04	9.80	0.78	11.38	1.55
8	Do. dissolved,	91.89	0.61	6.79	0.71	10.20	1.39
9	Bolivian guano, . .	89.17	0.96	9.19	0.77	11.35	1.55
10	Do. dissolved,	89.51	0.87	8.64	0.88	10.61	1.49
11	Sulphuric acid, . .	90.64	0.77	7.84	0.75	9.30	1.44
12	Gypsum, ...	89.92	0.76	8.58	0.74	8.68	1.39

COMPLETE ANALYSES OF THE ASH OF NOS. 1 AND 7.

	No. 1 (Nothing).	No. 7 (Ground Bones).
Peroxide of iron, ...	2.02	3.11
Lime, ...	9.91	9.90
Magnesia, ...	1.51	2.61
Potash, ...	35.30	35.26
Soda, ...	2.01	...
Chloride of potassium, . .	...	1.47
Chloride of sodium, . . .	7.72	11.36
Phosphoric acid, . . .	6.30	9.99
Sulphuric acid, . . .	9.51	9.83
Chlorine, ...	...	...
Carbonic acid, . . .	14.06	5.35
Silica, ...	3.98	2.56
Carbon, ...	7.68	8.56

It will be observed that these analyses have been made in such a manner as to give a comparison of the feeding value of the differ-

ent specimens of turnip, and, also, to show whether the presence of phosphates in the manure had any effect on the quantity of phosphoric acid in the ash.

Although there is a perceptible difference in the percentage of *water*, yet with the exception of bones and coprolites there is no apparent connection attributing this result to one class of manures more than to another. With these the quantity of water is greatest from the *dissolved* manures; it would thus appear that the increase of crop is obtained at a certain sacrifice of quality, which, however, is much more than counterbalanced by the increased weight of produce.

The nitrogen varies comparatively little in the different samples; the great difference is in the other organic matters, which naturally are highest in those samples which contain the smallest amount of water.

The most interesting point, however, is the marked effect of phosphatic manures in increasing the quantity of phosphoric acid in the ash—see 5th column in the Table.

The complete analyses of the ash of Nos. 1 and 7—the one grown with a phosphatic manure, and the other without any manure—show comparatively little difference, with the exception of the quantity of phosphoric acid.

SOLUBLE AND INSOLUBLE PHOSPHATES.

By SAMUEL D. SHIRREFF, Saltcoats, East Lothian.

[Premium—Medium Gold Medal.]

I GIVE a report of four experiments conducted in 1863 with dissolved and undissolved phosphates. The report may not be deemed worthy of a premium, but I have only to mention in regard to the practical part that, in carrying out these experiments, every possible personal attention was given to see the manures properly mixed, weighed, and equally sown. I will, as briefly as possible, with each table of experiments, mention *how* these trials were carried out, in order that some estimate may be formed whether they offer any reliable data for the future guidance, either of the agricultural chemist, or the practical agriculturist. It is well known that science and practice do not always agree; there is something hid in nature disturbing this harmony. Agricultural chemistry has already done much to increase the produce of the soil, and will still do much more; but the agricultural chemist must be assisted by the practical agriculturist in order to reconcile theory and practice. I was induced to make the comparative trials with coprolites and bone-ash, by reading the opinion of an agricultural chemist, that on some soils coprolites (the price of the raw material under £3 per ton) would produce a better result than a bone-ash superphosphate (the raw material above £5 per ton). This statement coming from one well qualified to give an opinion, I thought the agricultural community would be blind to their interest if they did not try to prove this. Why, here is a direct saving of nearly £3 per ton! I made the experiments on two classes of soil, and on one of them the coprolites proved superior, as the tables will show.

EXPERIMENTS IN TABLE No. 1.

I will first mention in regard to this table that I made two experiments in 1862 with dissolved and undissolved bone phosphates, and the result was highly favourable to the dissolved phosphates. On the same plots of ground—viz., a quarter of an imperial acre—I determined to carry out the result of the wheat crop. The ground was ploughed in the beginning of February 1863, the ridges being separated by a wide furrow; the wheat was sown on the 10th of February by a broadcast machine, and the same mixture of artificial manures which were applied to the turnip crop—viz., 5 cwt. bone-ash superphosphate and 3 cwt. Peruvian guano, *versus* 5 cwt. of undissolved bone-ash and 3 cwt. of Peruvian guano—were sown broadcast along with the seed at the rate of 4 cwt. per acre. The

wheat was sown at three bushels per acre. The braird, after the dissolved phosphates, was decidedly superior; and although, to judge from the bulk on the ground when the grain was in ear, the impression was in favour of No. 2—viz., the undissolved phosphates—the straw when the grain was reaped was much softer, and the ears did not ripen so well. The quality of the grain No. 1 was superior, weighing 1¼ lb. per bushel more than the other; the straw was also of finer quality, and there was less chaff and less light grain.

Table No. 2—Experiments on Swedes.

The braird of No. 1 was much better than that of No. 2, and kept in advance till the middle of October, when No. 2 appeared to grow more vigorous, and the stems were much more luxuriant in November when the turnips were weighed. These experiments were made on a quarter of an imperial acre, and two drills of each lot (201 yards long) were weighed.

Table No. 3—Experiments on Swedes.

The braird of No 1 was by far the best, and continued in advance till the beginning of November, when the crop was weighed. The stems of No. 2 were much greener and fresher-looking, and of decidedly more value for giving to ewes or young cattle. In this table I give for comparison the result of farmyard manure and guano. Estimating the farmyard manure at 6s. per ton, the cost per acre would be about £6 sterling.

Table No. 4—Experiments on White Globe Turnips, sown on the 1st of June.

There were four drills 201 yards long, and we weighed the two middle drills of each lot. It was perfectly calm when the manures were sown. The experiments were tested on the 14th of November. No. 1, 6 cwt. of bone-ash superphosphate and 2 cwt. of nitrate of soda; No. 2, 6 cwt. of coprolite phosphate and 2 cwt. of nitrate of soda; No. 3, 6 cwt. of undissolved bone-ash and 2 cwt. nitrate of soda. In this trial No. 1 again took the lead. No. 3 was far behind at the time of singling, but gradually gained, the stems being peculiarly dark and vigorous, even up to the time when the turnips were weighed. No. 2 gradually gained on No. 1, and some weeks before the turnips were tested, appeared decidedly superior. In this experiment the coprolites gave 7 cwt. per acre more than bone-ash, and this extra crop the produce of a much smaller outlay. The undissolved phosphates are also superior to the dissolved phosphates, which may be attributed to the very light character of the soil.

The results of these experiments are decidedly favourable to dis-

solved phosphates when applied to the turnip crop. The character of the soil where the experiments were made was well suited to undissolved phosphates. This superiority has been maintained during two seasons the very opposite to each other. The summer of 1862 being unusually wet—there were only three days in the month of June without rain; whereas the summer of 1863 was remarkably dry—there being only one wet day in the month of June. The field where the white turnips were grown—in which the undissolved phosphate proved superior to the other—is almost pure sand. In regard to the wheat crop, there was more bulk of straw. This shows the greater lasting qualities of the undissolved phosphates; but even here the other produced more money value. The most profitable manure to apply to the turnip crop is the one which will give the greatest produce without calculating too much on its lasting quality. On a large turnip crop depends very much the successful cropping of a rotation.

I have samples of all the manures, with their analysis; also samples of the soils where the experiments were made.

TABLE No. 1.

Previous crop, swedish turnips, grown with mixture of Peruvian guano, dissolved and undissolved phosphates, applied at the rate of 8 cwt. per acre, without farmyard manure. The turnip crop on Plot No. 1—viz., the mixture of Peruvian guano and dissolved phosphates—weighed 2 tons 16 cwt. per acre more than Plot No. 2, which was manured with Peruvian guano and undissolved phosphates.

Ground in each lot under experiment, ¼ of an imperial acre.

Produce of wheat crop after dissolved and undissolved phosphates, combined with Peruvian guano:—

	Quantity of Manure applied.	Rate per Acre.	Cost.			Produce.		Weight of 4 Bushels.		Light.	Straw.		Chaff.
			£	s.	d.	st.	lb.	st.	lb.	lb.	st.	lb.	lb.
No. 1.	5 stones bone-ash superphosphate, . 3 stones Peruvian guano, . .	4 cwt.	1	16	10	176	8	17	12	11	203	14	112
No. 2.	5 stones undissolved bone, . . 3 stones Peruvian guano, . .	4 cwt.	1	18	1½	174	8	17	7	18	213	8	140

There were two ridges in each experiment, 101 yards long by 18 feet in width. The experiments were separated by a wide furrow. The wheat was sown on the 10th February 1863 by a broadcast machine. The manures were sown broadcast along with the seed. The crop was reaped, carried, and thrashed under equality of circumstances.

Character of soil, lightish free gravelly turnip land.

22 lb. of straw to the stone.

Table No. 2.

Experiments with Swedish Turnips, ¼ of an imperial acre—8 drills, 201 yards long, 27 inches wide. Swedes sown on the 21st of May 1863, weighed on the 28th November.
Portion weighed, 2 drills of each lot.

	Rate per Acre.	Cost per Acre.	Produce.
No. 1.	4 cwt. bone superphosphates, . ; 4 cwt. guano, Peruvian, ...	£3 19 0	21 tons, 16 cwt., 5 stones, 10 lb.
No. 2.	4 cwt. coprolite phosphates, . . ; 4 cwt. Peruvian guono, . . .	3 10 0	20 tons, 8 cwt.
No. 3.	4 cwt. dissolved phosphatic guano, ; 4 cwt. Peruvian guano, . . .	4 3 0	21 tons, 13 cwt., 3 stones, 6 lb.

Table No. 3.

Experiments with Swedish Turnips sown five days earlier, with more moisture, causing larger crops.

	Rate per Acre.	Cost per Acre.	Produce.
No. 1.	5 cwt. bone-ash dissolved, . . . ; 3 cwt. Peruvian guano, . . .	£3 13 9	24 tons, 12 cwt., 6 stones, 12 lb.
No. 2.	5 cwt. undissolved bone-ash, . . ; 3 cwt. Peruvian guano, ...	3 13 9	23 tons, 8 cwt., 4 stones, 9 lb.
	For comparison I give the result of farmyard manure and guano:—		
No. 3.	12 tons of dung, ... ; 4 cwt. guano, ...	£6 2 0	25 tons, 19 cwt., 3 stones, 6 lb.

Character of the soil, fine average turnip loam.

Table No. 4.

Experiments with White Globe Turnips, sown on 1st June 1863, tested 14th Nov.

	Rate per Acre.	Cost per Acre.	Produce.
No. 1.	6 cwt. of bone-ash dissolved, . . ; 2 cwt. of nitrate of soda, . .	£3 12 6	21 tons, 12 cwt.
No. 2.	6 cwt. coprolites, ... ; 2 cwt. nitrate of soda, ...	2 19 0	21 tons, 19 cwt., 5 stones, 10 lb.
No. 3.	6 cwt. undissolved bone-ash, . . ; 2 cwt. nitrate of soda, ...	3 12 6	21 tons, 17 cwt., 2 stones, 4 lb.

Character of soil, light sandy land.

Experiments repeated in 1864 have given a quite different result from those made in 1863. Both seasons were remarkably dry, and the nature of the soil where the experiments of 1863 were made, was much more suited for undissolved phosphates than the field in which the subsequent trials were conducted, the percentages of clay and sand being nearly reversed. From a partial analysis by Dr Macadam, the field in which the experiments were made in 1863 gave 65 sand and 33 clay; and this season these proportions were just reversed. I am satisfied, however, it was not the difference of soil that altered the results—it was caused by some peculiarity of the season. Our swedes were severely mildewed towards the end of September, and I observed the experiments with dissolved phosphates suffered much more than the others; they never recovered, and became prematurely ripe. On the other hand, those with the undissolved phosphates scarcely hung a leaf, continued quite vigorous, and the bulbs grew much during October and November. I have carried out the results in the cereal crops for two seasons. These, especially last year (crop 1864), are much in favour of undissolved phosphates. I have always found more weight of straw per acre where undissolved phosphates had been applied to the green crop. It depends entirely on the nature of the season whether most straw, most grain, and most profit are in unison; but it is a great matter to secure plenty of straw. I have no hesitation in recommending the use of undissolved phosphates to the green crop, when this is wanted by the cereal crop.

Experiments in growing Swedish Turnips with dissolved and undissolved phosphates, made at Saltcoats, crop 1864. Swedes sown on the 14th of May, weighed 23d November; ¼ imperial acre in each experiment.

TABLE No. 1.—Phosphates in combination with a large proportion of ammonia—viz.,

	Weight of crop imperial acre.			
	tons.	cwt.	st.	lb.
6 cwt. Peruvian guano and 2 cwt. undissolved bone-ash, .	29	1	1	9
6 cwt. Peruvian guano and 2 cwt. dissolved bone-ash, . .	25	13	5	6

TABLE No. 2.—Phosphates in combination with a small proportion of ammonia—viz.,

	tons.	cwt.	st.	lb.
3 cwt. Peruvian guano and 5 cwt. undissolved bone-ash, .	26	9	7	1
3 cwt. Peruvian guano and 5 cwt. dissolved bone-ash, . .	21	7	2	0

Character of soil, about 65 per cent clay, 35 sand.

PREMIUMS AWARDED BY THE SOCIETY IN 1864.

NOTE.—The awards at Stirling Show, having already been published, are excluded.

REPORTS.

1. L.30 to Archibald Sturrock, Struthers Cottage, Kilmarnock, for a Report on the agriculture of Ayrshire.
2. Gold medal, or L.10, to Patrick Shirriff, Haddington, for Report on new variety of agricultural plants—"Shirriff's Bearded Wheat."
3. Gold medal, or L.10, to John Maclaren, Rossie Priory, Inchture, for a Report of experiments on feeding two kinds of Leicesters.
4. Gold medal, or L.10, to George Armatage, veterinary surgeon, Pensher, Fence Houses, for a Report on foot-and-mouth disease.
5. Gold medal, or L.10, to Christopher Young Michie, forester, Duthil, Carr Bridge, Morayshire, for a Report on the uses and value of timber.
6. Medium gold medal, or L.5, to said Christopher Young Michie, for a Report on the general management of plantations.
7. L.5 to Hugh Borthwick, shepherd, Traquair Knowe, Peebles, for a Report on scab in sheep.

DISTRICT COMPETITIONS.

CATTLE.

The District of Cowal.

BULLS, Class I.*	1. Duncan M'Arthur, Auchadunan, Cairndow,	L.7	0	0
	2. Duncan Turner, Corrachaive, Dunoon,	4	0	0
BULLS, Class II.†	Robert Lamont, Ardyne, Dunoon,	6	0	0
HEIFERS.	1. Thomas Lochhead, Toward, Dunoon,	5	0	0
	2. John C. Turner, Dunlaskin, Dunoon,	3	0	0

The District of the Royal Northern Society.

BULLS.	A. Cruickshank, Sittyton, Aberdeen,	Silver Medal.		
BULLS, Class I.	1. Alex. Paterson, Mulben, Keith,	L.3	10	0‡
	2. William M'Combie, Tillyfour, Aberdeen,	2	0	0‡
BULLS, Class II.	Robert Walker, Montbletton, Banff,	6	0	0
HEIFERS.	1. Henry A. Rannie, Mill of Boyndie, Banff,	5	0	0
	2. George Milne of Kinaldie, Aberdeen,	3	0	0

The District of Deeside.

BULLS.	Sir James H. Burnett of Leys, Bart.,	Silver Medal.		
BULLS, Class I.	1. James C. Thom, Quithelhead, Durris, Aberdeen,	L.3	10	0‡
	2. John Anderson, Craigton, Banchory Ternan,	2	0	0‡
BULLS, Class II.	John Ross, Nether Park, Drumoak, Aberdeen,	6	0	0
HEIFERS.	1. William Wilson, Brathins, Banchory,	5	0	0
	2. John Smith, West Mains of Campfield, Banchory,	3	0	0

The County of Inverness.

BULLS, Class I.	1. Duncan M'Pherson, banker, Kingussie,	L.7	0	0
	2. Robert Anderson, Kildrummie, Nairn,	4	0	0

* Class I., Bulls calved before 1st January 1862.
† Class II., Bulls calved after 1st January 1862.
‡ Half Premiums awarded, the number of lots being under six.

BULLS, Class II.	William Fraser, Upper Lairgs, Daviot, Inverness,	L.6 0 0
HEIFERS.	1. David M'Bean, Nairnside, Cawdor, Nairn,	5 0 0
	2. Robert Anderson, Kildrummie, Nairn,	3 0 0

The County of Elgin.

BULLS.	James Geddes, Orbliston, Fochabers,	Silver Medal.
BULLS, Class I.	1. Robert Anderson of Lochdhu, Nairn,	L.7 0 0
	2. Robert Scott, Manbeen, Elgin,	4 0 0
BULLS, Class II.	James Geddes, Orbliston, Fochabers,	6 0 0
HEIFERS.	1. John M'Kessack, Balnaferry, Forres,	5 0 0
	2. John Adam, Dykeside, Elgin,	3 0 0

The County of Nairn.

BULLS.	Robert Anderson of Lochdhu, Nairn,	Silver Medal.
BULLS, Class I.	1. James M'Kessock, Heathmont, Nairn,	L.7 0 0
	2. A. F. M'Lennan, Meikle Urchany, Nairn,	4 0 0
BULLS, Class II.	James M'Pherson, Carnoch, Cawdor,	6 0 0
HEIFERS.	1. James M'Kessock, Heathmont, Nairn,	5 0 0
	2. Alex. Walker, Brightmony, Auldearn,	3 0 0

The District of Annandale.

BULLS.	Alex. Jardine of Applegirth, Lockerbie,	Silver Medal.
BULLS, Class II.	Joseph Kerr, Barlouth, Torthorwald, Dumfries,	L.6 0 0
HEIFERS.	1. Robert Jardine of Balgray, Lockerbie,	5 0 0
	2. James Riddick, Hartwood, Lockerbie,	3 0 0

The District of Kintyre.

BULLS, Class I.	1. James Greenlees, Moy, Campbeltown,	L.7 0 0
	2. John Mitchell, Ballymenach, Campbeltown,	4 0 0
BULLS, Class II.	Samuel Mitchell, Chescan, Campbeltown,	6 0 0
HEIFERS.	1. Robt. Cunningham, Lochsainsh, Campbeltown,	5 0 0
	2. Chas. M'Connachy, Knockrioch, Campbeltown,	3 0 0

DRAUGHT-HORSES.

The County of Lanark.

STALLIONS.	Wm. Robertson, Mitchelton, Lochwinnoch,	L.25 0 0
MARES.	Allan Struthers, Broomfield, Larkhall,	10 0 0
FILLIES.	John Clarke, Sweethope, Bothwell,	5 0 0

The County of Linlithgow.

STALLIONS.	Samuel Clark, Manswrae, Kilbarchan,	L.25 0 0
MARES.	David M'Gibbon, Inveravon, Polmont,	10 0 0
FILLIES.	James Young, Balvormie, Linlithgow,	5 0 0

The County of Edinburgh.

STALLIONS.	James Kerr, Lochend, Kilbirnie,	L.25 0 0
MARES.	James Lawrie, Mitchelston, Stow,	10 0 0
FILLIES.	James Lawrie, Mitchelston, Stow,	5 0 0

The District of Wester Ross.

STALLIONS.	John Barr, Harperland, Kilmarnock,	L.25 0 0
MARES.	Murdo Bethune, Dreim, Beauly,	10 0 0
FILLIES.	William Allan, Dunrornie, Dingwall,	5 0 0

ENTIRE COLTS.

The Stewartry of Kirkcudbright.

One-Year-Old Colts.	William Rigg, High Banks, Kirkcudbright,	L.4 0 0

The District of Machars in Wigtownshire.

Two-Year-Old Colts.	James M'Kie, Culnoag, Whithorn,	L.3 0 0*
One-Year-Old Colts.	John Anderson, Airies, Newton-Stewart,	4 0 0

LEICESTER SHEEP.

The County of Haddington.

Tups.	Arthur Jas. Balfour of Whittingham, Prestonkirk,	Silver Medal.
Tups.	Thomas Simson, Blainslie, Lauder,	L.5 0 0
Shearling Tups.	Thomas Simson, Blainslie, Lauder,	5 0 0
Ewes.	John Lees, Marvingston, Gifford,	2 10 0*
Shearling Ewes.	David Ainslie of Costerton, Blackshiels,	2 0 0*

The District of the Border Union Society.

Tups.	George Simson, Courthill, Kelso,	L.5 0 0
Shearling Tups.	Thomas Stark, Mellendean, Kelso,	5 0 0
Shearling Ewes.	George Simson, Courthill, Kelso,	2 0 0*

The County of Forfar.

Tups.	William Goodlet, Bolshan, Arbroath,	L.5 0 0
Shearling Tups.	William Goodlet, Bolshan, Arbroath,	5 0 0
Ewes.	Charles Lyall, Old Montrose,	5 0 0
Shearling Ewes.	William Goodlet, Bolshan, Arbroath,	4 0 0

CHEVIOT SHEEP.

The Islands of Islay, Jura, and Colonsay.

Tups.	William Webster, Daill, Bridgend, Islay,	L.5 0 0
Ewes.	Colin Hay, Colmkill, Port Ellen, Islay,	5 0 0
Shearling Ewes.	Colin Hay, Colmkill, Port Ellen, Islay,	2 0 0*

The District of West Teviotdale.

Tups.	Thomas Welsh, Braefoot, Moffat,	Silver Medal.
Tups.	Thomas Welsh, Braefoot, Moffat,	L.5 0 0
Shearling Tups.	John Moffat, Craik, Hawick,	5 0 0
Ewes.	William Turnbull, Falnash, Hawick,	5 0 0
Gimmers.	Thomas Welsh, Hislop, Hawick,	4 0 0

The County of Peebles.

Tups.	Sir Graham G. Montgomery, Bart., M.P.,	Silver Medal.
Tups.	John Archibald, Blackhouse, Duddingston, S. Queensferry,	L.5 0 0
Shearling Tups.	Charles Alexander, Easter Knowe, Stobo, Peebles,	5 0 0
Ewes.	John Archibald, Blackhouse,	5 0 0
Shearling Ewes.	William Ballantyne, Wormiston, Eddlestone,	2 0 0*

* Half Premiums awarded, the number of lots being under six.

The Pastoral District of Ross-shire.

TUPS.	David Mundell, Auchindrean, Dingwall, .	L.5 0 0
SHEARLING TUPS.	John MacLennan, Camoch, Strathconon, .	5 0 0
EWES.	David Mundell, Auchindrean, Dingwall, .	5 0 0
SHEARLING EWES.	William Laidlaw, Rogie, Dingwall, . .	4 0 0

The County of Sutherland.

TUPS.	John Miller, Downreay, Thurso, . .	L.5 0 0
SHEARLING TUPS.	John B. Dudgeon, Crakaig, Golspie, . .	5 0 0
EWES.	Marcus Gunn, Culgower, Golspie, . .	5 0 0
SHEARLING EWES.	William Mitchell, Ribigil, Tongue, Lairg, .	4 0 0

BLACKFACED SHEEP.

The District of Badenoch and Rothiemurchus.

TUPS.	Messrs Macdonald, Strathmashie, Laggan, .	L.5 0 0
SHEARLING TUPS.	Messrs Macdonald, Strathmashie, Laggan, .	5 0 0
EWES.	N. P. Stewart, Biallid, Kingussie, . .	2 10 0*
SHEARLING EWES.	Messrs Macdonald, Strathmashie, Laggan, .	2 0 0*

The District of Lochaber.

TUPS.	A. C. Campbell of Monzie, Fort-William,	Silver Medal.
TUPS.	W. Reid, Glenfinnon, Fort-William, . .	L.5 0 0
SHEARLING TUPS.	John Cameron, Achintee, Fort-William, .	5 0 0
EWES.	James Sinton, Cornavon, Fort-William, .	5 0 0
SHEARLING EWES.	J. M. Pender, Achindall, Fort-William, .	4 0 0

The District of Lorn.

TUPS.	Chas. A. Stewart of Achnacone, Appin,	Silver Medal.
TUPS.	Donald Sinclair, Achinreir, Bunaw, . .	L.5 0 0
SHEARLING TUPS.	Chas. A. Stewart of Achnacone, Appin, .	5 0 0
EWES.	Donald Sinclair, Achinreir, Bunaw, . .	5 0 0
SHEARLING EWES.	Colin M'Callum, Baligown, Oban, . .	4 0 0

SWINE.

The District of Alford.

BOARS.		Andrew Wilson, Whiteside, Forbes, .	Silver Medal.
BOARS.	1.	Charles Bruce, Waltheton, Whitehouse, .	L.4 0 0
	2.	J. & J. Martin, Mill of Keig, Whitehouse, .	2 0 0
SOWS.	1.	Andrew Wilson, Whiteside, Forbes, . .	3 0 0
	2.	Alex. Aitken, Meikle Endovie, Alford, .	1 0 0

The District of Dalkeith.

BOARS.		The Duke of Buccleuch, K.G., . . .	Silver Medal.
BOARS.	1.	A. Naismith, Windlestrawlee, Edinburgh,	L.4 0 0
	2.	Thomas Sadler, Norton Mains, Ratho, .	2 0 0
SOWS.	1.	Thomas Sadler, Norton Mains, Ratho, .	3 0 0
	2.	Wm. Ford, Hardengreen, Dalkeith, . .	1 0 0

DAIRY PRODUCE.

The County of Lanark.

CURED BUTTER.	1.	Mrs Smith, Blairmuckhole, Shotts, . .	L.3 0 0
	2.	Dd. Strachan, Meikle Earnock, Hamilton, .	2 0 0

* Half Premiums awarded, the number of lots being under six.

SWEET-MILK CHEESE.	James Allan, West Mains, Stonehouse,	Silver Medal.
	1. John Dunlop, Whiteshawgate, Strathaven,	L.3 0 0
	2. D. Dunlop, Middlecroft, Strathaven,	2 0 0

The Western District of Mid-Lothian.

CURED BUTTER.	Robert Steuart of Carfin, Westwood, West-Calder,	Silver Medal.
	1. John Chalmers, Heads, Whitburn,	L.3 0 0
	2. James Walker, Tippethill, Bathgate,	2 0 0

The Lower Ward of Renfrewshire.

CURED BUTTER.	1. Arthur Lang, Pennytersal, Kilmalcolm,	L.3 0 0
	2. John M'Ghie, West Kilbride, Kilmalcolm,	2 0 0

The District of Kilmarnock.

The Medium Gold Medal was awarded to the following:—

SWEET-MILK CHEESE.	John Baird, Kirkmabreck, Creetown, Kirkcudbright.
	William Bone, Auchencloigh, Galston.

SEED COMPETITIONS.

The Silver Medal has been awarded to the following:—

The County of Ayr.

James Wright, South Sanquhar, St Quivox, for Chevalier Barley.
P. B. Mure Macredie of Perceton, Irvine, for English Poland Oats.
James Blair, Girlrig, Dundonald, for Perennial Rye-Grass Seed.

The District of Wester Ross.

Henry Sim, Ardullie, Dingwall, for White Essex Wheat.

The District of the Black Isle.

Donald M'Kay, Kessock Farm, North Kessock, for Potato Oats.

The County of Caithness.

Alex. Laing, Skaill, Thurso, for Common Bere.
Alex. Adam of Lynegar, Thurso, for Birley Oats.

The Islands of Shetland.

George Bruce, Veensgarth, Lerwick, for Sandy Oats.
George Bruce, Veensgarth, Lerwick, for Caithness Bere.
George Bruce, Veensgarth, Lerwick, for Rye-Grass Seed.

The District of Spey, Avon, and Fiddochside.

Dr Alex. Creyk, Georgetown, Ballindalloch, for Norfolk Barley.
Miss Macpherson Grant of Aberlour, Craigellachie, for English Birley Oats.

The District of Strathearn.

John Whyte, Muirhead, Dunning, for Potato Oats.

PLOUGHING COMPETITIONS.

In the course of the year 1863-1864, the Society's Medal was awarded at 129 Ploughing Competitions, the details of which are given in the 'Transactions' for July last.

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Silver Medal has been awarded to the following:—

The County of Renfrew.
Alexander Graham of Capellie, Barrhead, for Ayrshire Bull.

The District of Strathbogie.
Charles Bruce, Broadland, Huntly, for Shorthorn Bull.

The District of Strontian.
Hugh Maclaine of Rahoy, Strontian, for 2 Highland Heifers.

The Island of Skye.
John Stewart, Duntulm, Portree, for Highland Bull.

The County of Banff and District of Turriff.
Andrew Longmore, Rettie, Banff, for Shorthorn Bull.

The Upper Ward of Lanarkshire.
John Watson, Culterallers, Biggar, for Blackfaced Tup.

The Western District of Mid-Lothian.
John Wallace, Burnhouse, Uphall, for Ayrshire Bull.
R. M. Buchanan, Livingstone Mill, Mid-Calder, for Draught Mare.

The District of Penicuick.
James Wilson, Wester Cowden, Dalkeith, for Draught Mare.
Thomas Murray, Eastside, Penicuick, for Blackfaced Tup.

The District of Buchan.
Alex. Beattie, Newlandshill, Strichen, for Shorthorn Bull.
George Baird of Strichen, for Polled Cow.

The District of Wester Ross.
Major Wardlaw, Belmaduthy, Munlochy, for a Shorthorn Bull.

The District of Spey, Avon, and Fiddochside.
William Cantlie, Keithmore, Dufftown, for Shorthorn Bull.
Alexander Paterson, Mulben, Keith, for Polled Heifer.

The District of Kilmarnock.
Wm. Donald, Sornbeg, Galston, for Ayrshire Bull.
Thomas Lindsay, Townend, Craigie, for Ayrshire Cow.
Hugh Woodburn, Annandale, Kilmaurs, for best-managed Farm.
James Pollock, Raws, Kilmarnock, for best-managed Dairy.
Hugh Woodburn, Annandale, Kilmaurs, for best-managed Green Crop.
James Brown, Whinpark, Kilmarnock, for best-kept Fences.
Hugh Stewart, Raws, Kilmarnock, for Hedge-Cutting.

The District of the Black Isle.
A. P. Smith, Munlochy, for Shorthorn Bull.

The District of Fettercairn.

William Brown, Pitnamoon, Laurencekirk, for Polled Angus Cow.
Charles Durward, Eagle Inn Farm, Fettercairn, for best-managed Green Crop.

The District of Mauchline.

James Wallace, Auchenbraine, Galston, for Ayrshire Bull and Cow.

The District of Cumnock.

R. & P. Wardrope, Changue, Cumnock, for Ayrshire Bull.
William Craig, Watstone, Cumnock, for Ayrshire Cow.
William Craig, Craigvilla, New Cumnock, for Sweet-Milk Cheese.
William Anderson, Burnside, Cumnock, for Cured Butter.
John Hayman, Holm, Cumnock, for best Collection of Roots.
James Murray, Donaldson Braes, Cumnock, for best Collection of Seeds.

The District of Sanquhar.

James Hyslop, M'Crirrick's Cairn, for Ayrshire Bull.
H. D. B. Hyslop, Tower, Sanquhar, for Ayrshire Cow.
James Campbell, Knockenjig, for Sweet-Milk Cheese.
Mrs Paterson, Craigdarroch, for Cured Butter.
Thomas M'Kie, Burnfoot, for best Collection of Roots.

The County of Caithness.

James Henderson of Bilbster, Wick, for Shorthorn Bull.
Sir John Sinclair, Bart., Barroch House, Wick, for Shorthorn Cow.

The District of Inverness.

Robert Gentle, Dell, Inverness, for laid Cheviot washed Wool.
Robert Sinton, Leadclune, Inverness, for laid Blackfaced unwashed Wool.
James Arres, Woodside, Inverness, for laid Cross washed Wool.

The County of Kincardine.

Arch. Henderson, Blackiemuir, Laurencekirk, for best-managed Green Crop.

The District of Mauchline.

Thomas Borland, Mauchline Mains, for best-managed Dairy.

The District of Bute.

Archibald Martin, Largiezean, Rothesay, for best-managed Green Crop.

The District of Leochel-Cushnie.

Alexander Hosie, Drumdage, Aberdeen, for polled Bull.
Peter M'Combie, Farmtown of Lynturk, Aberdeen, for polled Cow.
Wm. M'Combie, of Lynturk, Aberdeen, for best-managed Green Crop.

COTTAGES AND GARDENS.

For the Best-kept Cottages and Gardens.

First Cottage Premium, L.1, 5s., and Medal when Four Competitors; Second, L.1; Third, 15s. First Garden Premium, L.1, 5s., and Medal when Four Competitors; Second, L.1; Third, 15s.

Parish of Leochel-Cushnie.—1st Cottage Premium and Medal, William Mortimer; 2d, William M. Reid; 3d, George Edward. 1st Garden Premium and Medal, William M. Reid; 2d, William Mortimer; 3d, Joseph Durward.

PARISH OF WEST CALDER.—1st Garden Premium and Medal, John Gowans; 2d, David Steven; 3d, George Brown. Medal to Alexander Martin for Garden.

PARISH OF NEWBURGH AND ABDIE.—1st Garden Premium and Medal, James Barclay; 2d, Thomas Braid; 3d, John Young.

PARISH OF URR.—1st Cottage Premium and Medal, Mrs John Postlethwaite; 2d, Mrs John Murdoch; 3d, Mrs John Marshall. 1st Garden Premium and Medal, John Johnstone; 2d, Mrs Richardson; 3d, John Kirk. Medal to Mrs Burnie for Garden.

PARISH OF DOUGLAS.—1st Garden Premium, John Frame; 2d, James Davidson; 3d, John Brown.

PARISH OF BROUGHTON.—1st Garden Premium and Medal, John Marchbank; 2d, James Marshall; 3d, John Henderson.

PARISH OF STONEYKIRK.—1st Cottage Premium and Medal, James M'Harg; 2d, Mrs M'Gowan; 3d, Andrew Connely. 1st Garden Premium and Medal, Andrew Connely; 2d, Samuel Thomson; 3d, Peter M'Culloch.

MEDALS GIVEN IN AID OF PRIVATE COMPETITIONS.

BALLINDALLOCH.—John Beattie, Marionburgh, for best-kept Cottage and Garden.

LOGIEALMOND AND GLENALMOND.—John M'Dairmid, for best Cottage Garden.

VETERINARY COLLEGE.

Silver Medals were awarded, at the Annual Examination in April last, to the following parties:—

1. Thomas Stokoe, Hay, Brecon, for best General Examination.
2. Frederick Danby, Holtby, Yorkshire, for best Examination in Horse Pathology.
3. Joseph Callender, Falkirk, for best Examination in Cattle Pathology.
4. Thomas Stokoe, Hay, Brecon, for best Examination in Anatomy.
5. William Hall, Sedgefield, Durham, for best Examination in Physiology.
6. Thomas Stokoe, Hay, Brecon, for best Examination in Chemistry.
7. W. C. Lawson, Bolton, for best Examination in Materia Medica.
8. John Jack, Davidson's Mains, Edinburgh, for best Anatomical Preparation.

JN. HALL MAXWELL, *Secretary.*

EDINBURGH, 1*st February* 1865.

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1. BALANCE in the Royal Bank of Scotland on 30th Nov. 1863, .			£1722 16 6
2. MEDALS on hand at do., ...			30 17 0
3. ARREARS of Subscriptions at do. considered recoverable,		£240 11 6	
Whereof due by Members compounding for Life, and thereby extinguished, ...		27 16 0	
			212 15 6
4. INTEREST AND DIVIDENDS—			
1. Interest on £9500 lent on Heritable Security, .		£369 17 8	
„ on £5570 lent on Debenture Bonds, .		216 15 10	
„ on Bank Account, ...		37 4 7	
„ on £400 lodged in Bank, waiting investment,		16 18 0	
		£640 16 1	
2. Dividends—			
On £12,070, 14s. 1d. of Bank Stocks (the value of which at 30th November 1864 is £24,015, 4s. 4d.) . . .	£1027 2 4		
On £500 Stock of British Fishery Society,	20 0 0		
		1047 2 4	
			1687 18 5
5. ANNUAL SUBSCRIPTIONS for the year, ...			927 1 6
6. LIFE SUBSCRIPTIONS, ...			768 13 6
7. CHEMICAL DEPARTMENT—Annual Subscriptions, . . .			113 7 6
8. LOCAL COMPETITIONS—Subscriptions in aid of, . . .			49 10 0
9. RECEIPTS on account of former Shows—			
Kelso Show, 1863.			
Subscription from Peeblesshire, . .		£78 4 8	
„ „ Selkirkshire, . .		71 1 0	
		£149 5 8	
Entry Money, &c., received, . . .		1 13 0	
		£150 18 8	
Perth Show, 1861—Stall Rents, . . .		1 7 6	
			152 6 2
10. STIRLING SHOW, 1864—Receipts, per Abstract, . . .			3223 17 2
			£8889 3 3

EDINBURGH, *4th January* 1865.

Agricultural Society of Scotland, for the Year 1863-64.

Discharge.

1. Establishment—		
1. Secretary's Salary,		£500 0 0
2. Allowance for Heating, Cleaning, and Service,		83 5 0
3. Auditor's Fee,		30 0 0
4. Allowance to Editor of 'Transactions,'		42 0 0
5. Allowance to Editor of 'Veterinary Proceedings,'		10 0 0
6. Clerks' Salaries,		188 7 0
7. Allowance to Curator of Machinery,		10 0 0
8. Feu-Duty, Taxes, Repairs, &c.—		
Feu-Duty,	£36 11 8	
Taxes,	36 12 1	
Insurance,	5 17 0	
Water-Duty,	5 6 8	
Repairs, &c.,	25 15 4	
		110 2 9
		£973 14 9
2. Chemical Department.—Salary to Professor Anderson,		300 0 0
3. Veterinary Department—		
1. Allowance to Professor Dick,	£26 5 0	
2. Medals awarded to Students,	6 8 0	
3. Advertising,	6 2 9	
		38 15 9
4. Museum—		
1. Feu-Duty, Taxes, Water-Duty, Gas, and Insurance,	£77 1 9	
2. Repairs,	12 9 8	
3. Wages to Porter,	39 15 0	
4. Coals,	9 15 0	
		139 1 5
5. Premiums Paid—		
1. Kelso Show, 1863,	£388 13 3	
2. Stirling Show, 1864,	930 0 0	
3. District Competitions, 1863,	577 12 0	
4. Ploughing Competitions—Medals awarded,	83 17 0	
5. Essays and Reports,	123 0 0	
		2103 2 3
6. Printing, Advertising, and Stationery—		
1. Printing,	£143 18 0	
2. Advertising,	21 18 1	
3. Stationery,	21 0 0	
		186 16 1
7. Postage and Receipt Stamps,		64 5 7
8. Old and Remarkable Trees—		
1. Allowance to late Charles Mackintosh as Editor,	£15 15 0	
2. Printing,	23 18 6	
		39 13 6
9. Miscellaneous Expenses—		
1. Subscription to Meteorological Society,	£5 0 0	
2. Reporting General Meetings,	3 3 0	
3. Expenses in London in connection with Cattle Disease Bills,	37 17 0	
4. Inverness Show, 1865; Travelling and Meetings,	14 9 5	
5. General Travelling Expenses, Cabs, &c.,	11 1 10	
6. Bank Charges, incidental Outlays, &c.,	6 0 11	
7. Business Accounts,	8 4 8	
		85 16 10
10. Perth Show, 1861—		
Allowance to Sub-Contractors,	£10 0 0	
Auctioneer,	1 1 0	
		11 1 0
11. Kelso Show, 1863.—Travelling Expenses of Judges,		8 8 0
12. Stirling Show, 1864.—Expenses, per Abstract,		1867 19 7
13. Balance in Bank at 30th November 1864,		2284 10 6
14. Sum on Deposit-Receipt (waiting investment),		416 18 0
15. Medals on hand at 30th November 1864,		42 2 0
16. Arrears of Subscriptions—		
1. Recoverable Arrears,	£257 0 0	
2. Irrecoverable, and written off,	69 18 0	
		326 18 0
		£8889 3 3

ALEX. MACDUFF,..................*Member of Finance Committee.*
WELLWOOD H. MAXWELL, *Do. do. do.*
KENNETH MACKENZIE, C.A., *Auditor.*

STIRLING SHOW, 1864.

RECEIPTS.

1. LOCAL SUBSCRIPTIONS—							
1. Stirlingshire—Voluntary Assessment on Proprietors,				£371	14	2
2. „ General Subscription,				163	2	7
3. Town of Stirling—Donation by Burgh,				25	0	0
4. „ Do. by Cowan's Hospital,				20	0	0
5. „ Do. by Allan's Hospital,				5	0	0
6. „ General Subscription, less cost of Collection,				98	6	2
7. Dumbartonshire—General Subscription,				174	1	0
8. West District of Perthshire—Assessment on Proprietors,				60	18	7
9. „ „ General Subscription,				43	9	0
10. Clackmannanshire—General Subscription,				5	19	6
11. Local Societies—Dumbartonshire,				25	0	0
„ „ Killearn,				5	0	0
„ „ Kilmadock,				5	0	0
				£1002	11	0
2. AMOUNT COLLECTED DURING SHOW—						
1. Drawn at Gates,	£1588	11	0			
2. By Sale of Catalogues and Awards,	140	11	2			
				1729	2	2
3. ENTRY MONEY—						
1. On Stock,	£46	16	6			
2. On Implements,	26	8	0			
				73	4	6
4. RENT OF STALLS AND SHEDDING, &c.—						
1. Rent of Stalls,	£288	10	0			
2. Do. of Implement Shedding,	70	1	6			
3. Do. of Refreshment Booth,	45	0	0			
				403	11	6
5. INTEREST from Banks,				15	8	0
				£3223	17	2

EDINBURGH, *4th January* 1865.

Abstract of Accounts.

Payments.

1. Premiums drawn at 30th November 1864,*				£930	0	0
2. Show-Yard—						
1. Fitting up Show-Yard,	£1137	0	0			
2. Rent of Park,	35	0	0			
3. Bedding for Stock,	41	10	0			
4. Water Fountains, Closets, and Troughs,	7	10	0			
5. Refreshments for Judges, &c., in Yard,	21	5	6			
6. Zinc Tickets, Boards, and Ropes,	10	6	6			
7. Miscellaneous Expenditure,	5	9	6			
				1258	1	6
3. Police Force,				22	15	8
4. Travelling Expenses of Judges, Secretary, Clerks, &c.,				45	3	4
5. Hotel and other Bills for Judges, Deputation of Directors, Secretary, &c.,				106	11	0
6. Tickets to Banquet for Judges and Staff,				12	15	0
7. Fittings in Corn Exchange,				15	1	6
8. Printing—						
1. Catalogues,	£115	0	0			
2. List of Awards,	11	15	0			
3. Placards,	20	0	0			
4. Premium Lists, Certificates, Circulars, &c.,	64	5	0			
5. Members' and Subscribers' Tickets,	5	14	0.			
				216	14	0
9. Advertising—						
1. At Railway Stations,	£20	0	0			
2. In Newspapers,	28	18	6			
				48	18	6
10. Allowance to Local Secretary,				21	0	0
11. Outlay by him,				4	4	0
12. Allowance to Mr Robert Patterson, Stirling,				10	10	0
13. Allowance to Curator of Machinery,				6	6	0
14. Clerks,				30	10	0
15. Assistants, Porters, and Attendants,				11	11	6
16. Postage Account,				29	13	3
17. Carriages, Bank Charges, Telegrams, and Miscellaneous items,				4	19	0
18. Allowance to 28 Pipers, including travelling expenses,				20	19	6
19. Stationery,				2	5	10
Balance,				425	17	7
				£3223	17	2

* Premiums undrawn at 30th November 1864, £415, 7s.

ALEXR. MACDUFF,..................*Member of Finance Committee.*
WELLWOOD H. MAXWELL,.......*Do. do. do.*
KENNETH MACKENZIE, C.A., *Auditor.*

STATE of the FUNDS of the HIGHLAND and AGRICULTURAL SOCIETY,
At 30th November 1864.

		£	s.	d.
I. INVESTMENTS—				
	1. Heritable Bond,	£9,500	0	0
	2. Bank Stocks, present value,	24,015	4	4
	3. Railway Debentures,	4,570	0	0
	4. Glasgow Water Corporation Debenture,	1,000	0	0
	5. Ten Shares, or *£500*, of the British Fishery Society,	200	0	0
	6. In Bank for Investment,	416	18	0
		£39,702	2	4
II. HERITABLE PROPERTY, per Valuation,		7,037	18	5
III. BALANCE IN ROYAL BANK,		2,284	10	6
IV. MEDALS ON HAND,		42	2	0
V. ARREARS CONSIDERED RECOVERABLE,		257	0	0
		£49,323	13	3

KENNETH MACKENZIE, *Auditor.*

INDEX.

APPENDIX.

PRINTED BY WILLIAM BLACKWOOD AND SONS, EDINBURGH.

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

IN

1864.

CONTENTS.

PRELIMINARY NOTICE.

WHEN the HIGHLAND SOCIETY was instituted in the year 1784, and established by Royal Charter in 1787, its operation was limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of Agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have, for three quarters of a century, been directed to the promotion of the science and practice of Agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are awarded for Reports on almost every subject connected with the cultivation of the soil; the rearing and feeding of stock; the management of the dairy; the growth of timber; the extension of cottage accommodation; the improvement of agricultural machinery and implements; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society, are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal Towns of Scotland, at which

exhibitors from all parts of the United Kingdom are allowed to compete.

2. A System of District Shows, instituted for the purposes of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of local Agricultural Associations.

3. The encouragement and promotion of a proper system of Agricultural Education, under powers conferred by a Supplementary Royal Charter, authorising " The COUNCIL of the HIGHLAND AND AGRICULTURAL SOCIETY on EDUCATION" to prescribe a curriculum of study, and to grant Diplomas to Students of Agriculture who shall pass the requisite examination (see p. 64).

4. The advancement of the Veterinary Art, by conferring the Society's Diploma on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise.

5. The appointment of a Chemist for the purpose of promoting the application of science to Agriculture. Investigations on subjects of importance are conducted in the Laboratory, and published in the Transactions. Members can obtain analyses, reports, and advice, on terms below those charged to others (see p. 66).

6. The establishment of an Agricultural Museum illustrative of the vegetable products of the country.

7. The periodical publication of the Transactions, which comprehend the proceedings in the Laboratory, reports of experiments, and other communications addressed to the Society. The Transactions are published by Messrs BLACKWOOD and SONS, Edinburgh, and may be obtained by Members of the Society, separately, at the reduced price of 4s. annually, or conjoined with Messrs Blackwood's Journal of Agriculture, for 8s.

CONSTITUTION AND MANAGEMENT.

The general business of the HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of a Royal Charter, which authorises the enactment of Bye-Laws. Business connected with Agricultural Education is conducted under the authority of a Supplementary Royal Charter, also authorising the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Ten Extraordinary, and Thirty Ordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor and other Officers. The proceedings of the Directors are reported to General Meetings of the Society, held in January, and in June or July. The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Twelve Members.

New Members are admitted at the half yearly General Meetings. The ordinary subscription is £1, 3s. 6d. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £12, 12s. to £7. 1s. Tenant-Farmers, Secretaries and Treasurers of local Agricultural Associations, resident Agricultural Factors, and Proprietors farming the whole of their own lands whose valuation does not exceed £500, are admitted on a subscription of 10s. annually, or £5, 5s. for life.

Members of the Society are entitled to apply for District Premiums,—to report Ploughing Matches for the Medal,—to attend Shows and exhibit Stock free of charge,—to consult the Chemist at reduced rates,—and to obtain the Transactions at a modified price.

Orders, payable at the Royal Bank of Scotland, are issued by the Directors, in name of the parties in whose favour Premiums have been awarded.

All communications must be addressed to "JOHN HALL MAXWELL, Esq., C.B., Secretary of the Highland and Agricultural Society of Scotland, No. 6 Albyn Place, Edinburgh."

ESTABLISHMENT FOR 1864.

President.

HIS GRACE THE DUKE OF ARGYLL, K.T

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THE EARL OF DALKEITH, M.P.
THE EARL OF HOME.
THE EARL OF ROSSLYN.
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WILLIAM GRAY, Southfield.
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WILLIAM SADLER, Ferrygate.
JAMES WILSON, Wester Cowden.

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ALEXANDER SLIGHT, *Curator of Implements and Machines.*
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Premiums, . . .	Professor LYON PLAYFAIR, C.B.
Publications, . .	ALEXANDER FORBES IRVINE of Drum.
Veterinary College, .	Professor GOODSIR.

Council on Education.

By a Supplementary Chapter under the Great Seal, granted in 1856, the Society is empowered to prescribe a Curriculum for Agricultural Education, and to grant Diplomas.

Members of Council named by Charter.

The DUKE OF ARGYLL, *President*.
The LORD ADVOCATE.
The DEAN of FACULTY.
The PROFESSOR of AGRICULTURE.
The PROFESSOR of ANATOMY.

The LORD JUSTICE-GENERAL, *Vice-President*.
The PROFESSOR of BOTANY.
The PROFESSOR of CHEMISTRY.
The PROFESSOR of NATURAL HISTORY

Members of Council named by Society.

Sir GEORGE CLERK, Bart.
Sir W. GIBSON-CRAIG, Bart.
Sir ALEXANDER C. GIBSON MAITLAND, Bart.

GEORGE HOPE, Fenton Barns.
JOHN MILLER of Leithen.
ROBERT RUSSELL, Pilmuir.
JOHN WILSON, Edington Mains.

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Botany—Professor BALFOUR.

Chemistry—Professor ANDERSON.

Natural History—Professor ALLMAN.

Veterinary Surgery—Professor DICK.

Field Engineering and Surveying—JOHN MILLER of Leithen, C.E., and JAMES STIRLING, C.E.

Book-Keeping and Accounts—KENNETH MACKENZIE, C.A., and PETER M'LAGAN of Pumpherston.

Museum.

GEORGE IV. BRIDGE, OPEN TO THE PUBLIC FROM 11 TO 4 EVERY DAY, EXCEPT MONDAY.

PREMIUMS.

GENERAL REGULATIONS FOR COMPETITORS.

All Reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter similarly marked, containing the name and address of the Reporter; initials must not be used.

None of the sealed letters, except those belonging to reports found entitled to at least one-half of the Premium offered, will be opened without the Author's consent.

Reports, for which a Premium, or one-half of it, has been awarded, become the property of the Society, and cannot be published, in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the Author if applied for within twelve months.

When a Report is unsatisfactory, the Society is not bound to award the whole, or any part of a premium.

All Reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded. Weights and measurements must be indicated by the imperial standards.

The decisions of the Board of Directors are final and conclusive as to all premiums, whether for Reports, or at general or district Shows, and it shall not be competent to raise any question or appeal touching such disicisions before any other tribunal.

Reports on subjects not included in the Premium list will be received, and honorary rewards will be given, when merited.

CLASS I.

REPORTS.

Section 1.—ON SUBJECTS CONNECTED WITH THE SCIENCE AND PRACTICE OF AGRICULTURE.

Note.—The Reports on Hiring Markets, for which premiums have been offered since 1860, must be lodged on 1st May 1864.

Reports in competition for premiums in last year's book, and due on 1st May next, must then be lodged.

1. AGRICULTURE OF ABERDEENSHIRE AND BANFFSHIRE.

For an approved Report on the Agriculture of Aberdeenshire and Banffshire.—Thirty Sovereigns.

The Report should embrace full details of the different systems of farm management observed in the district, and of the progress which Agriculture has made within the last 25 years.

Reports to be lodged by 1st November 1864.

2. AGRICULTURE OF PERTHSHIRE.

For an approved Report on the Agriculture of Perthshire—Thirty Sovereigns.

The Report should embrace full details of the different systems of farm management observed in the district, and of the progress which Agriculture has made within the last 25 years. Particular reference must be made to the system followed in the Carse districts of the county.

Reports to be lodged by 1st November 1865.

3. EFFECT OF SPECIAL MANURES OVER A ROTATION.

For an approved Report, to be made after a rotation, on the comparative effects, immediate and continued, of different special Manures—Thirty Sovereigns.

As the object of the premium is to encourage experiments for determining the value of various applications, as regards not only increased quantity and improved quality of crops, but also the permanence of the different substances throughout the rotation,

the Report must have reference to points such as specific gravity and quality of turnips—weights of grain, straw, and hay—effects on straw and hay for fodder, and such like. The results obtained from each application to be compared with those of the ordinary manuring of the farm. Each experiment to be conducted on not less than one rood of land, and the exact composition of the special manures used must be given.

Reports to be lodged by 1st November in any year.

4. PHOSPHATIC AND AMMONIACAL MANURES.

For an approved Report on the different effects of Phosphatic manures and Ammoniacal manures, and of a mixture of these substances, when applied to the raising of early and late sown turnips —The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1865.

5. SOLUBLE AND INSOLUBLE PHOSPHATES.

For an approved Report on the comparative effects of manures containing insoluble Phosphates, such as bone-ash and coprolites, and the same substances in which the Phosphates have been rendered soluble by acids—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1865.

6. MANURES PRODUCED BY DIFFERENT KINDS OF FEEDING.

For an approved Report of the result of experiments for ascertaining the comparative value of farm-yard manure obtained from cattle fed upon different varieties of food, by the application of such manures to farm crops—Twenty Sovereigns.

The Report must state the effects produced on two successive crops by the application of manure obtained from cattle fed on different sorts of food, such as turnips and straw alone; and turnips and straw, with an addition of oil-cake, linseed, bean-meal, grain, or other substances. The animals should be as nearly as possible of the same age, weight, condition, and maturity, and each lot should receive daily the same quantity of litter; and, except as to the difference of food, they must be treated alike.

The preparation of the manure, by fermentation or otherwise, should be in every respect the same; and it is desirable that not

less than two several experiments be made with each kind, and that the ground to which it is to be applied be as equal as possible in quality and condition.

Reports to be lodged by 1st May in any year.

7. MANURE MADE WITH AND WITHOUT COVER.

For an approved Report on the comparative value of Manure made in the ordinary manner, and of Manure kept under cover till applied to the land—Twenty Sovereigns.

The experiment may be conducted either with manure made in the open strawyard, contrasted with that made in covered hammels or boxes, or with manure made in feeding-houses, part of which shall have been placed under cover, and part removed to the open dung-pit, and kept carefully unmixed with any other manure. Preference will be given to experiments embracing both of these modes. The cattle must be fed and littered alike. There must be at least an acre of land experimented on with each sort of manure—the different lots must be manured to the same extent, and be equal in soil, and the crops must be accurately weighed and measured on two separate portions of each lot, not less than 20 poles. The result, as given by two successive crops, to be reported.

Reports to be lodged by 1st May in any year.

8. TOP-DRESSING FOR CEREALS.

For an approved Report on the substances which may be most profitably employed in top-dressing Cereal Crops—The Gold Medal, or Ten Sovereigns.

The report must state the nature of the substances used, the time and cost of the application, and the comparative results, which must be contrasted with those obtained from a portion of the same field to which no top-dressing was applied.

Reports to be lodged by 1st November 1864.

9. AUTUMN MANURING.

For an approved Report on the comparative advantages of applying Manure to the stubble in Autumn, or in the drills in Spring for turnips, potatoes, or beans—Twenty Sovereigns.

The experiment must extend over two years, and comprise a green crop and a grain crop. It must be conducted on not less than four acres—one-half of which shall be dunged in autumn, and the other in spring, with manure made as nearly as possible in the same way, and of equal quantity and quality. The treatment and condition of the land prior to the experiment must be mentioned.

As the object of this premium is to determine the comparative advantages of autumn manuring, there will be no restriction as to labouring the land, but the Reporter must state how that was done on each lot during the experiment.

Reports to be lodged by 1st May 1865.

10. TOWN SEWAGE.

For an approved Report on the results of the application of town sewage to the farm, as obtained by the reporter from practical operations conducted by himself—Thirty Sovereigns.

Reports to be lodged by 1st May 1865.

11. IMPROVED VARIETIES OF AGRICULTURAL PLANTS.

For an approved Report on the means successfully employed for obtaining new and superior varieties, or improved sub-varieties of any of the cereal grains, grasses, roots, or other agricultural plants—The Gold Medal, or Ten Sovereigns.

It is necessary that the varieties and sub-varieties reported upon shall have been proved capable of reproduction from seed, and also that the relation they bear to others, or well-known sorts, should be stated. The Reporter is further requested to mention the effects that he may have observed produced by different soils, manures, &c., on the plants forming the subjects of reports, and how far he may have ascertained such effects to be lasting.

Should any improved variety reported upon be the result of direct experiment by cross impregnation, involving expense and long-continued attention, a higher premium will be awarded.

Reports to be lodged by 1st November 1864.

12. DIFFERENT KINDS OF OATS.

For an approved Report of experiments conducted for the purpose of determining the relative productiveness in corn and straw

of the following varieties of Oats:—Potato, Hopetoun, Sandy, late Angus, and Black Tartar—Fifteen Sovereigns.

The experiment must embrace crops 1864 and 1865. Intention to compete must be intimated to the Secretary not later than 1st May 1864. The soil shall be uniform in quality and condition. One acre must be allowed for each variety, and the lots must be separated by spaces not less than two feet wide. Care must be taken to select true samples of seed for crop 1864, the produce of which shall be used as seed in 1865. Samples of the original seed, and of each year's crop, to be lodged with the Secretary. The oats may be sown, by drill or broadcast, and the crops shall be inspected by a committee in June and July following. The whole produce shall be weighed and measured; and care must be taken thoroughly to clean the thrashing-machine before testing each variety. The Report shall further specify the quantity of each variety of seed sown—where it was obtained—the dates of sowing, brairding, earing, ripening—the properties and appearances of the crops when growing—and the produce each year in corn and straw.

Reports to be lodged by 1st November 1865.

13. COMPARATIVE PRODUCTIVENESS, &c., OF POTATOES.

For an approved Report on the comparative productiveness and general qualities for use and keeping, of the different kinds of Potatoes used in field culture—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1865.

14. COMPARATIVE PRODUCTIVENESS, &c., OF TURNIPS.

For an approved Report of the comparative productiveness, and general qualities for use and keeping of the different kinds of Swedish, Yellow, and White Turnips, generally used in field culture—The Medium Gold Medal, or Five Sovereigns.

Reports to be lodged by 1st May 1865.

15. CABBAGE.

For an approved Report on the cultivation of the Cabbage as a field crop—The Medium Gold Medal, or Five Sovereigns.

The experiment must be conducted on not less than one acre, and contrasted with a like extent under turnips in the same field. Both lots must have been under one rotation, and must be prepared and manured in the same manner.

Reports to be lodged by 1st May 1865.

16. VEGETABLE PRODUCTIONS OF INDIA, CHINA, AMERICA, &c.

For an approved Report on the hardy and useful herbaceous plants, including Grains and Grasses of China, Japan, the Islands of the Eastern Archipelago, the Himalaya Country, the Falkland and South Sea Islands, California, the high north-western districts of America, or any other country where such climate exists as to induce the belief that the plants may be beneficially introduced into the cultivation of Scotland—The Gold Medal, or Ten Sovereigns.

Reporters are required to give the generic and specific names of the plants treated of, with the authority for the same—together with the native names, in so far as known; and to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is further requested that the descriptions be accompanied, in so far as possible, with specimens of the plants, and their fruit, seed, or other products.

Reports to be lodged by 1st November in any year.

FEEDING STOCK.

The experiments specified in Nos. 17, 18, 19, and 20, must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten sheep. The animals selected should be of the same age, sex, and breed, and, as nearly as possible, of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and, if killed, their dead weight and quantity of tallow.

17. BEST MODES OF HOUSING FATTENING CATTLE.

For an approved Report on the comparative advantages of fattening Cattle in stalls, in loose houses or boxes, and in sheds or hammels—Twenty Sovereigns.

The Report must detail the comparative result of actual experiments. The same quantities and kinds of food shall be used. Information is required as to the comparative expense of attendance, the cost of erecting the buildings, and any other circumstances deserving of attention. The state of the weather during the experiment in point of temperature and wetness must be particularly noted and reported.

Reports to be lodged by 1st May in any year.

18. DIFFERENT DESCRIPTIONS OF FOOD.

For an approved Report of experiments for ascertaining the actual addition of weight to growing or fattening stock, by the use of different kinds of food—Twenty Sovereigns.

The attention of the experimenter is directed to turnips, carrots, beet, mangold-wurzel, potatoes, cabbage, as well as to beans, oats, barley, Indian corn, linseed, oil-cake, or rape-cake, and to the effect of warmth and proper ventilation, and the difference between food cooked and raw. The above roots and other kinds of food are merely suggested; Competitors are neither restricted to them, nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substances in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared; this will form an interesting experiment of itself, for Reports of which encouragement will be given.

Reports to be lodged by 1st May in any year.

19. COMPARATIVE QUALITIES OF DIFFERENT FEEDING CAKES.

For an approved Report on the comparative feeding qualities of Linseed-Cake and other Cakes, to be ascertained by feeding two lots of Cattle on different varieties of these substances, with or without Turnips, or other ordinary food, equal quantities of the cakes being given—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1865.

20. COMPARATIVE FATTENING QUALITIES OF PURE AND CROSS-BRED SHEEP.

For an approved Report of experiments for determining the comparative fattening qualities of pure and cross-bred Sheep—The Gold Medal, or Ten Sovereigns.

One lot must consist of any pure breed, the other of any cross between that and another breed. The same descriptions of food must be given; the quantities consumed, and the increase in the weight and value of each lot must be carefully noted.

Reports to be lodged by 1st May 1865.

21. MURRAIN.

For an approved Report on the nature, symptoms, causes, preventive and remedial treatment of Murrain in domestic animals—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1864.

22. SCAB IN SHEEP.

For an approved Report on the nature, symptoms, causes, preventive and remedial treatment of Scab in Sheep—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1864.

23. RURAL ECONOMY ABROAD.

For an approved Report, founded on personal observation, of any useful practice, in rural economy, adopted in other countries and susceptible of being introduced with advantage into Scotland—The Gold Medal.

The purpose chiefly contemplated by the offer of this premium, is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland.

Reports to be lodged by 1st November in any year.

SECTION 2.—WOODS AND PLANTATIONS.

1. EXTENSIVE PLANTING.

For an approved Report by a Proprietor who shall, within the five preceding years, have planted not less than 150 acres. The whole planting operations that may have been conducted by the Reporter within the five years, whether completed or not, must be embraced, and he must state the expense—description of soil—age, kind, and number of trees planted per acre—mode of planting, draining, and fencing—general state of the plantation—and any other observations of interest—The Gold Medal.

Reports to be lodged by 1st November in any year.

2. FORMATION AND MANAGEMENT OF YOUNG PLANTATIONS.

For an approved Report of Plantations formed within a period of not more than ten, nor less than five years preceding the date of the Report—The Gold Medal, or Ten Sovereigns.

The Report should comprehend every interesting particular; among others, the exposure, altitude, and general climate of the locality—the character and condition of the soil and subsoil—a detailed statement of the expense, including that of enclosing, draining, and fencing, and a specification of the manner in which these operations were performed—the mode of planting adopted—the prevailing weather while planting, and for a month after the operation—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks and deaths at the end of three years—the system of management—the state of the plantations at the date of making the Report—and any other observation of interest.

Reports to be lodged by 1st November in any year.

3. GENERAL MANAGEMENT OF PLANTATIONS.

For an approved Report of the management of Plantations, from the commencement of the first thinning till the period of yielding full-grown timber—The Gold Medal, or Ten Sovereigns.

The Report should embrace the following points:—the progress of the different sorts of trees—the effects of altitude and exposure—the general advantages of shelter—the mode of thinning and pruning adopted—the uses and value of the thinnings—the plan of registry and of valuing, or a specimen of the method in which the forester's book is kept—the valuation at the time of the Report—together with such general remarks as may be thought useful.

The Report is not expected to embrace the formation and early management, farther than the description of soil, kinds of plants, whether mixed or in masses, together with a note of the expense from the time of planting to the commencement of the first thinning, in so far as such information is in the possession of the Reporter.

Reports to be lodged by 1st November in any year.

4. USES AND VALUE OF TIMBER.

For an approved Report on the economic uses and comparative value of different descriptions of Timber grown in Scotland—The Gold Medal, or Ten Sovereigns.

This premium may be regarded as a sequence to Nos. 2 and 3;

the object being to obtain the practical and economic results of planting, by ascertaining the purposes to which it has been applied, and the pecuniary returns it has yielded.

The Reporter, besides stating the actual results of his own observation and experience, should indicate the objects which planters ought to have in view with reference to profitable return, by stating the kinds of trees that should be planted—the periods at which they should be cut—the purposes to which they can be applied—and the returns that may be looked for, in different localities, and under different circumstances.

There must be a general description of the management, soil, altitude, exposure, &c., of the particular woods reported on, and attention is directed to the difference supposed to exist in the quality of natural and planted timber.

Reports to be lodged by 1st November in any year.

5. PLANTING ON EXPOSED OR ON BARREN TRACTS.

For an approved Report on successful planting within the influence of the sea, or on exposed sterile tracts, founded on observation of the habits and appearance of the different sorts of trees [illegible] best suited for such situations—The Gold Medal, or [illegible].

The plantations reported on must not be less than ten years old.

Information is particularly desired regarding the species and varieties of trees calculated for growing in situations unfavourable to most of those generally cultivated, as bleak heaths, sandy links, unsheltered maritime situations, and high northern exposures.

The Reporter must specify the extent of planting and mode of drainage and fencing—the nature of the soil and subsoil—the elevation and exposure of the locality—its distance from the sea; and, if in his power, he should notice the geological [illegible] of the district.

[illegible] lodged by 1st November in [illegible].

6. [illegible]

[illegible]

Reports to [illegible]

7. AMERICAN AND CANADIAN TREES.

For an approved Report on the American and Canadian forest-trees adapted for cultivation in Great Britain—The Medium Gold Medal, or Five Sovereigns.

The Reporter will enumerate and describe the varieties which have been, or which may be, usefully introduced from North America—the soils, situations, and conditions most suitable for them—their economic uses and qualities, and the success which may have attended the cultivation of any of them in Great Britain.

Reports to be lodged by 1st November 1864.

8. FOREST TREES OF RECENT INTRODUCTION.

For an approved Report on the more extended introduction of hardy, useful, or ornamental trees, which have not hitherto been generally cultivated in Scotland—The Medium Gold Medal, or Five Sovereigns.

The Report should specify as distinctly as possible the kind of trees introduced. The adaptation of the trees for use or ornament, and their comparative progress, should be mentioned. Attention is directed to the introduction of any tree as a nurse in young plantations, which, by growing rapidly for several years, and attaining maturity when at the height of 20 or 25 feet, might realise the advantages and avoid the evils of thick planting.

Reports to be lodged by 1st November in any year.

9. ROOTS OF CONIFERÆ.

For an approved Report of experiments on the uses to which the fibrous parts of the roots of Conferous trees may be applied—The Medium Gold Medal, or Five Sovereigns.

In North-West America, the fibrous parts of the roots of some Coniferous trees are extensively employed for purposes similar to those to which willows are applied in this country, more particularly when the wood has been grown on soft peaty soils. The object of the premium is to elicit information regarding the possibility of profitably extracting, and economically applying the vast quantities of roots left in the ground.

Reports to be lodged by 1st November in any year.

Section 3.—LAND IMPROVEMENTS.

1. GENERAL IMPROVEMENT OF ESTATES.

To the Proprietor who shall report the most judicious, successful, and extensive improvement—The Gold Medal, or Ten Sovereigns.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the reporter's proprietorship.

Reports to be lodged by 1st May in any year.

2. RECLAMATION OF WASTE LAND BY TILLAGE.

1. For an approved Report by a Proprietor or Tenant of having reclaimed, within the six preceding years, not less than fifty acres of Waste Land—The Gold Medal, or Ten Sovereigns.

2. For an approved Report by a Tenant of having reclaimed within the four preceding years, not less than twenty acres of Waste Land—The Medium Gold Medal, or Five Sovereigns.

3. For a similar Report by a Tenant of having reclaimed not less than ten acres—The Silver Medal.

The Reports may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of a profitable character, and a rotation of crops must

have been concluded before the date of the Report. *A detailed statement of the expenditure and return*, and a certified measurement of the ground, are requisite.

Reports to be lodged by 1st May in any year.

3. IMPROVEMENT OF NATURAL PASTURE WITHOUT TILLAGE.

1. For an approved Report of the improvement of the pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise without tillage, in situations where tillage may be inexpedient—The Gold Medal or Ten Sovereigns.

2. For an approved Report of a similar improvement of not less than ten acres—The Silver Medal.

Reports must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

Reports to be lodged by 1st May in any year.

SECTION 4.—AGRICULTURAL MACHINERY.

INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

For approved Reports of such inventions or improvements, by the Reporters, of any Agricultural Implement or Machine as shall be deemed by the Society of public utility—Medals, or sums of money not exceeding Fifty Sovereigns.

Reports may be lodged with the Secretary at any time, and should be accompanied by drawings and descriptions of the implement or machine, and, if necessary, by a model.

CLASS II.

DISTRICT COMPETITIONS.

The money Premiums awarded at District Competitions will be paid on 1st January next, by precepts issued by the Directors. No payments must therefore be made by the Secretary or Treasurer of any local Association.

(*Grants in aid of* District Competitions *for* 1865 *must be applied for before* 1st November *next.*)

Section I. CATTLE.

1. *The District of Cowal.*
2. *The District of the Royal Northern Society.*
3. *The District of Deeside.*
4. *The County of Inverness.*
5. *The Islands of Shetland.*
6. *The County of Elgin.*
7. *The County of Nairn.*
8. *The District of Annandale.*
9. *The District of Kintyre.*
10. *The County of Ayr.*
11. *The County of Renfrew.*
12. *The District of Strathbogie.*
13. *The District of Strontian.*
14. *The Island of Skye.*
15. *The County of Banff and District of Turriff.*
16. *The County of Stirling.*

Conveners of Committees.

First District—Alexander S. Finlay of Castle Toward, M P.
Second District—Alexander Thomson of Banchory.
Third District—Sir James H. Burnett, Bart.
Fourth District—Eneas W. Mackintosh of Raigmore.
Fifth District—Robert Bell of Lunna.

SIXTH DISTRICT—Sir A. P. Gordon Cumming, Bart.
SEVENTH DISTRICT—W. A. Stables, Cawdor Castle.
EIGHTH DISTRICT—Sir William Jardine, Bart.
NINTH DISTRICT—John Lorn Stewart of Coll.
TENTH DISTRICT—Sir James Fergusson, Bart., M P.
ELEVENTH DISTRICT—Lieut.-Col. Mure of Caldwell.
TWELFTH DISTRICT—Robert Simpson of Cobairdy.
THIRTEENTH DISTRICT—Sir Thomas Miles Riddell, Bart.
FOURTEENTH DISTRICT—Alexander K. Mackinnon of Corry.
FIFTEENTH DISTRICT—Alexander Morison of Bognie.
SIXTEENTH DISTRICT—John Stirling of Kippendavie.

PREMIUMS.

1. For the best Bull, of any pure breed, not exceeding eight years old, belonging to a Proprietor or Factor—The Silver Medal.

2. For the best Bull, of any pure breed, calved before 1st January 1862, and not exceeding eight years old, . £7

3. For the second best, ... £4

4. For the best Bull, of any pure breed, calved after 1st January 1862, ... £6

5. For the best two-year-old Heifer (if Highland breed, three years) of any pure breed, ... £5

6. For the second best, ... £3

The Money Premiums are restricted to Tenants, and Proprietors farming the whole of their own lands.

Note.—The Society's Premiums are granted to each district for three alternate years, on condition that the district shall, in the two intermediate years, continue the Competitions by offering for the same description of stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, a Silver Medal will be placed at the disposal of the Committee to be awarded to the best lot exhibited.

In 1864,

Nos. 1, 2, 3, and 4, are in competition for the last year.
Nos. 5, 6, 7, 8, and 9, for the first year.

Nos. 10, 11, 12, 13, 14, and 15, compete for local Premiums.

No. 16 is in abeyance on account of the General Show at Stirling.

RULES OF COMPETITION.

1. The Members of the Society connected with the respective Districts are appointed Committees for arranging the Competitions; five members to be a quorum.

2. The Convener of each district shall summon a Meeting of Committee for the purpose of determining the time and place of Competition, the nomination of Judges, and other preliminary arrangements. The time and place (which must be within the bounds of the district) shall be publicly intimated by Conveners.

3. The Competitions must take place between the 1st of April and the 10th of October, and are open to all parties within the district, whether Members of the local Association or not. The animals exhibited must belong to one of the following pure breeds: — Shorthorn—Ayrshire—Polled (Galloway, Angus, or Aberdeen)—Highland. The Bulls may be of one breed, and the Heifers of another. The Committee shall select the breed, and specify it in the returns.

4. Stock of an inferior description, or which does not fall within the prescribed regulations, shall not be placed for competition. The Premiums shall not be divided. *No money Premium shall be adjudged unless there are three lots exhibited, and not more than one-half unless there are six.* A competitor may exhibit two lots in each class. For the Medal, two lots are required.

5. An animal which has gained the Society's first Premium at a previous district or general Show is inadmissible in the same class, except for the Medal; and one which has gained a second money Premium can only thereafter compete in that class for the first.

6. A Tenant may compete with Proprietors or Factors for the Medal with a Bull which has gained the first money premium at a previous Show. When there is any doubt as to whether a Competitor should be ranked as a Proprietor or a Tenant, the point is left to the decision of the local Committee. Factors can only compete for the Medal.

7. A Bull, the property of two or more Tenants, may compete, although the Exhibitors may not be joint-tenants. Bulls not belonging to the District may compete, provided they are left within it for service.

8. Stock must be the property of the Exhibitor at the date of entry, *and no entry shall be received later than one week previous to the Show.* Entry-money shall not exceed 2½ per cent. on the amount of the premium to be competed for.

9. Bulls for which the money Premiums are awarded may be required to serve in the District at least one season; the rate of service to be fixed by the Committee.

10. Should it be proved to the satisfaction of the Committee that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Committee or Judges as to its qualifications or properties, the case shall be reported to the Directors, and submitted by them to the first General Meeting, in order that the Exhibitor shall be disqualified from again

competing at the Society's Shows, and his name, if he be a member, struck from the roll.

11. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Committee to judge of its validity.

12. Blank Reports will be furnished to the Conveners of the different districts. These must, in all details, be completed and lodged with the Secretary on or before the 1st of November next.

13. A Report of the Competition and Premiums awarded at the *intermediate* Local Shows, in the several Districts, signed by a Member of the Society, must be transmitted to the Secretary on or before the 1st November in each year, otherwise the Society's grant shall terminate.

14. It is to be distinctly understood, that in no instance does any claim lie against the Society for expenses attending a Show of Stock, beyond the amount of the Premiums offered.

SECTION 2. DRAUGHT HORSES.

1. *The County of Lanark.*
2. *The County of Linlithgow.*
3. *The County of Edinburgh.*
4. *The District of Wester Ross.*

Conveners of Committees.

FIRST DISTRICT—J. G. C. Hamilton of Dalzell.
SECOND DISTRICT—R. H. Johnston Stewart of Straiton.
THIRD DISTRICT—Sir James Gardiner Baird, Bart.
FOURTH DISTRICT—Keith W. Stewart Mackenzie of Seaforth.

PREMIUMS.

1. For the best Stallion, for agricultural purposes, not under three years and nine months, and not above twelve years old, £25
2. For the best Brood Mare, for agricultural purposes, . £10
3. For the best Filly, foaled after 1st January 1862, . £5

These premiums are granted for two years, £30 being contributed by the Society, and £10 by the District.

In 1864,

Nos. 1, 2, and 3 are in competition for the second year.
No. 4 for the first year.

RULES OF COMPETITION.

1. The Members of the Society in the District are appointed a Committee of Superintendence. They shall be convened in the manner and for the purposes prescribed by Nos. 1 and 2 of the Regulations for Cattle Competitions.

2. The competition for Stallions, and that for Mares and Fillies, may be held at different periods, but both must take place within the districts named, unless, in reference to Stallions, special permission has been obtained to the contrary.

3. If fewer than three animals be exhibited in any class, half the Premium only can be awarded. The Regulations for Cattle Shows, regarding intimation—entry of stock—its exclusion, if of inferior character—false entries—extra expenses—and the manner in which the Reports are to be certified and transmitted to the Society—are severally applicable to the Premiums for Horses. Evidence must be produced that the Prize Stallions have had produce. Mares must have foals at their feet, or be entered as being in foal; in the latter case payment of the Premium will be deferred till certificate of birth.

ENTIRE COLTS.

1. *The Stewartry of Kirkcudbright.*
2. *The District of Machars in Wigtownshire.*

Conveners of Committees.

FIRST DISTRICT—James Mackie of Bargaly, M.P.
SECOND DISTRICT—R. Vans Agnew of Barnbarroch.

PREMIUMS.

1. For the best Entire Colt, for agricultural purposes, foaled after 1st January 1862, ... £6
2. For the best Entire Colt, for agricultural purposes, foaled after 1st January 1863, ... £4

Four lots in each Class will warrant the award of full, and two lots of half, premiums. The other regulations for Horses are generally applicable. These premiums are granted for two years.

In 1864,

Nos. 1 and 2 are in competition for the last year.

SECTION 3. SHEEP.

The Premiums for sheep are granted for three alternate years, under the same conditions as those for Cattle. See Note p. 26.

A Silver Medal, as in the case of Cattle, is allowed for the intermediate years.

1. LEICESTER BREED.

1. *The County of Haddington.*
2. *The County of Fife.*
3. *The County of Forfar.*
4. *The District of the Border Union Society.*

Conveners of Committees.

FIRST DISTRICT—James W. Hunter of Thurston.
SECOND DISTRICT—J. T. Oswald of Dunnikier.
THIRD DISTRICT—Sir John Ogilvy, Bart., M.P.
FOURTH DISTRICT—Sir George H. Scott Douglas, Bart.

1. For the best Tup, belonging to a Proprietor or Factor—The Silver Medal.
2. For the best Tup of any age, ... £5
3. For the best Shearling Tup, ... £5
4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best Pen of five Gimmers or Shearling Ewes, £4

The Money Premiums are restricted to Tenants and Proprietors farming the whole of their own lands.

In 1864,

No. 1 is in competition for the last year.
Nos. 2, 3, and 4 for the first year.

2. CHEVIOT BREED.

1. *The Islands of Islay, Jura, and Colonsay.*
2. *The District of West Teviotdale.*
3. *The County of Peebles.*
4. *The Pastoral District of Ross-shire.*
5. *The County of Sutherland.*

Conveners of Committees.

FIRST DISTRICT—Richard D Campbell of Jura.
SECOND DISTRICT—Allan Eliott Lockhart of Borthwickbrae.
THIRD DISTRICT—Sir Graham G. Montgomery, Bart.
FOURTH DISTRICT—Sir Kenneth S. Mackenzie of Gairloch, Bart.
FIFTH DISTRICT—George Dempster of Skibo.

1. For the best Tup belonging to a Proprietor or Factor—The Silver Medal.
2. For the best Tup of any age, ... £5
3. For the best Shearling Tup, ... £5
4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best pen of five Gimmers or Shearling Ewes, . £4

The Money Premiums are restricted to Tenants and Proprietors farming the whole of their own lands.

In 1864,

No. 1 is in competition for the last year.
Nos. 2 and 3 for the second year.
Nos. 4 and 5 for the first year.

3. BLACK-FACED BREED.

DISTRICTS.

1. *The Districts of Badenoch and Rothiemurchus.*
2. *The District of Lochaber.*
3. *The District of Lorn.*
4. *The Upper Word of Lanarkshire.*
5. *The District of Argyll.*

Conveners of Committees.

FIRST DISTRICT—Cluny Macpherson.
SECOND DISTRICT—Donald Cameron of Lochiel.
THIRD DISTRICT—Sir John Macdougall of Macdougall, K.C.B.
FOURTH DISTRICT—John Ord Mackenzie of Dolphinton.
FIFTH DISTRICT—William Campbell of Ormsary.

1. For the best Tup, belonging to a Proprietor or Factor—The Silver Medal.
2. For the best Tup of any age, ... £5
3. For the best Shearling Tup, ... £5

4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best Pen of five Gimmers or Shearling Ewes, £4

The Money Premiums are restricted to Tenants, and Proprietors farming the whole of their own lands.

In 1864,

No. 1 is in competition for the last year.
No. 2 for the second year.
No. 3 for the first year.

Nos. 4 and 5 compete for local Premiums.

RULES OF COMPETITION.

1. The Members of the Society in the several Districts are appointed Committees as under Nos. 1 and 2 of the Regulations for Cattle Competitions, and they shall be convened by their respective Conveners in the manner and for the purposes specified in these regulations.

2. The Competition is open to all within the district; it shall take place between the 1st of April and the 10th of October, and the time and place must be publicly intimated by each Convener within his District.

3. Tups shall have served the usual number of Ewes for at least three weeks during the previous season. All prize Tups must serve within the District. The Competitions are open to Tups not belonging to the District, provided they are left for service. Ewes must have reared Lambs during the season. Ewes and Gimmers must be taken from regular breeding hirsels.

4. The Premiums shall not be divided. *No money Premiums shall be adjudged unless there are three lots exhibited, and only one-half if there are not six lots.* Each Competitor may show two lots. For the Medal two lots are required. The other Regulations for Cattle Competitions,—in regard to the date of Entry—the amount of Entry-Money—the placing of Stock—the exclusion of Animals which have gained premiums at previous Shows—the right of a Tenant, under certain circumstances, to compete for the Medal—reporting false entries—the Regulation as to expenses—and the manner in which the Reports must be certified and transmitted,—are applicable to the Premiums for Sheep.

5. Blank reports will be furnished to the Conveners of Districts. These must be accurately filled up in all details, signed by the Convener, and transmitted to the Secretary by the 1st of November. Reports of intermediate mpetitions must be lodged at the same time.

4. SHEARING SHEEP.

The Silver Medal will be given to the best Sheep-shearer in each of the Districts in which the Premiums for Sheep are in operation.

CONDITIONS.

1. Money Premiums must be awarded by the District at each Competition to the amount of not less than £2.

2. The District Convener will fix the time and place of Competition, and make all necessary arrangements.

3. The Medal shall not be awarded unless there are three competitors, and it shall always accompany the highest Money Premium. If two or more lots appear to be equally well executed, preference should be given to that executed within the shortest time.

4. The Conveners shall report the particulars of the Competition and the award of the Judges to the Society, along with the Report of the Sheep Premiums in the District.

Section 4. SWINE.

DISTRICTS.

1. *The District of Alford.*
2. *The District of Dalkeith.*

Conveners of Committees.

First District—R. Farquharson of Haughton.
Second District—Sir James Gardiner Baird, Bart.

1. For the best Boar belonging to a Proprietor or Factor—The Silver Medal.
2. For the best Boar, ... £4
3. For the second best, ... £2
4. For the best Breeding Sow, ... £3
5. For the second best, ... £1

The Money Premiums are restricted to Tenants, and Proprietors farming the whole of their own lands.

The above Premiums are given to each District for three consecutive years.

In 1864,

No. 1 is in competition for the second year.
No. 2 for the first year.

1. The Regulations for Cattle Competitions are generally to be held as applicable to the Premiums for Swine; and the Convener and Committee of the Society's Members in the District are accordingly referred to them.

2. Four lots in each Class will warrant the award of full, and two lots of half premiums. There must be at least two Competitors for the Medal.

3. Blank Reports will be furnished to the Conveners of Districts. These must be accurately filled up in all details, signed by the Convener, and transmitted to the Secretary by the 1st of November 1864.

CLASS III.

DAIRY PRODUCE.

DISTRICTS.

1. *The County of Lanark.*
2. *The Western District of Mid-Lothian.*
3. *The Lower Ward of Renfrewshire.*

Conveners of Committees.

First District—J. G. C. Hamilton of Dalzell.
Second District—Peter M'Lagan of Pumpherston.
Third District—Sir M. R. Shaw Stewart, Bart., M.P.

1. BUTTER.

1. For the best sample of Cured Butter (not less than 14 lbs.) belonging to a Proprietor or Factor—The Silver Medal.
2. For the best sample of Cured Butter (not less than 14 lbs.) £3
3. For the second best, ... £2

2. CHEESE.

4. For the best couple of Sweet-Milk Cheeses belonging to a Proprietor or Factor—The Silver Medal.
5. For the best couple of Sweet-Milk Cheeses, . . £3
6. For the second best, ... £2

The Money Premiums are restricted to Tenants and Proprietors farming the whole of their own lands.

The above Premiums are given to each District for three consecutive years.

In 1864,

No. 1 is in competition for the second year.
Nos. 2 and 3 for the first year.

CONDITIONS.

1. The Members of the Society, resident within the Districts, are appointed Committees of Superintendence, for the purposes expressed in the Regulations for Cattle Competitions. Each Committee shall fix such general regulations as they may consider proper—and, in particular, the time and place of competition.

2. Eight lots in any one Class will warrant an award of full, and four lots of half Premiums. There must be at least two Competitors for the Medal.

3. Competitors must certify that the Butter and Cheese exhibited by them are average specimens of the produce of their Dairies in 1864; and that the quantity produced during the season has not been less than 1 cwt. of Butter, or 2 cwt. of Cheese.

4. In the event of two or more competing lots being deemed equal in quality, the Premium shall be awarded to the Competitor who has made the larger quantity.

5. The successful Competitors, before receiving the Premiums, are required to transmit to the Secretary a detailed Report of the whole process followed by them in the manufacture of their Butter or Cheese.

6. Reports of the award of the Premiums to be lodged with the Secretary on or before the 1st November 1864.

MEDALS FOR CHEESE.

Two Medium Gold Medals will be placed at the disposal of the Ayrshire Society to be competed for at Kilmarnock. The one, for the best lot of Cheddar Cheese—the other, for the best lot of Sweet-Milk Cheese of any other variety; the Cheeses, in either case, to be made in Scotland.—Convener of Committee, Colonel Ferrier Hamilton of Cairnhill.

CLASS IV.

CROPS AND CULTURE.

I.—SEEDS.

The Society, with a view of aiding local Associations, gives the Silver Medal in the following districts, and for the following Seeds:—

1. County of AYR: Convener, Sir James Fergusson, Bart., M.P.

    1. Any variety of Wheat.
    2. Any variety of Barley.
    3. Any variety of Oats.
    4. Perennial Rye Grass.

2. County of STIRLING: Convener, John Stirling of Kippendavie.

    1. Any variety of Wheat.
    2. Any variety of Barley.
    3. Any variety of Oats.
    4. Any variety of Beans.
    5. Tares.

3. District of WESTER ROSS: Convener, Keith W. Stewart Mackenzie of Seaforth.

    1. Any variety of Wheat.
    2. Any variety of Barley.
    3. Any variety of Oats.
    4. Perennial Rye Grass.

4. District of The BLACK ISLE: Convener, Major Wardlaw, Belmaduthy.

    1. Any variety of Barley.
    2. Any variety of Oats.

5. County of CAITHNESS: Convener, Alexander Henderson of Stemster.

1. Any variety of Barley.
2. Any variety of Oats.

6. Islands of SHETLAND: Convener, Robert Bell of Lunna.

1. Any variety of Bere.
2. Any variety of Oats.
3. Perennial Rye Grass.

7. District of SPEY, AVON, and FIDDOCHSIDE: Convener, Sir George Macpherson Grant, Bart.

1. Any variety of Barley.
2. Any variety of Oats.

CONDITIONS.

1. In each District the Convener shall fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements, in concurrence with the other Members of the Society, and the local Association of the District. Conveners will be furnished with blank Schedules for reporting the awards.

2. The quantity shown in Competition by each Grower must not be less than three quarters of each variety of Grain, or two quarters of Beans or Grass Seeds. There must at least be two Competitors. The first Premium awarded by the District shall not be less than £1 for each kind of grain for which a Medal is claimed.

3. The Judges shall be guided in their awards—1*st*, By the purity of the Seed; 2*d*, By its freeness from extraneous seeds; and, 3*d*, Where there is an equality in these respects, by the weight.

4. Successful Competitors must transmit, free of expense, two quarts of each kind of seed, addressed to the Secretary at the Society's Museum, George IV. Bridge, Edinburgh.

5. The Returns must show, as accurately as possible, the produce per imperial acre, also the altitude, exposure, and nature of the soil on which the crops were raised, together with the dates of sowing and reaping, and the weight per bushel. The varieties for which Premiums have been given must be named. Reports of the several Competitions must be lodged by the 1st of November.

6. The medals will be continued in each District for five consecutive years. Applications from other Districts must be lodged with the Secretary of the Society by 1st November next.

2. PLOUGHING COMPETITIONS.

The Silver Medal will be given to the winner of the first Premium at Ploughing Competitions, where there are fifteen Ploughs, and Premiums to the amount of Three Sovereigns, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society, and the undernoted conditions have been observed :—

FORM OF REPORT.

I   of   Member of the Highland and Agricultural Society, hereby certify, that I attended the Ploughing Match of the   Association at   in the county of   on the   when   ploughs competed ;   of land was assigned to each, and   hours were allowed for the execution of the work. The sum of £   was awarded in the following proportions, viz. :—

[Here enumerate the names and designations of successful Competitors.]

CONDITIONS.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.

2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, No. 6 Albyn Place, Edinburgh.

3. Not more than one Match, in the same season, can take place within the bounds of the same Society or Association.

4. All Reports must be lodged within one month of the date of the Match, and certified by a Member of the Society who was present at it.

5. A Member can only report one Match, and a Ploughman can only carry one Medal, in the same season.

6. To warrant the Medal, there must have been fifteen Ploughs in Competition, and three Pounds awarded in Premiums.

7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others ; on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the sufficiency of the work below, as well as to its neatness above the surface.

3. REAPING MACHINES.

The Silver Medal will be given to the Servant found most expert at a trial of Reaping Machines, when not fewer than four were in operation, and Premiums to the amount of Two Sovereigns were awarded. Reports must be lodged with the Secretary not later than the 1st of November, by a Member who has inspected the work.

4. MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society being anxious to co-operate with local Associations, will give a limited number of Silver Medals annually, in addition to the Money Premiums awarded in the district :—

1. STOCK.—To Local Societies not on the list of District Competitions, awarding Premiums for Stock to the amount of £10, and reporting their Shows to the Secretary—The Silver Medal for the best Male and for the best Female animal of any Pure Breed.

Applied for by the Forbes and Fordyce Association—Convener, Sir John Stuart Forbes of Pitsligo, Bart.

Western District of Mid-Lothian Association—Convener, Peter M'Lagan of Pumpherston.

Penicuik Society—Convener, the Right Hon. Sir George Clerk, Bart.

Buchan Society—Convener, George Baird of Strichen.

Wester Ross Club—Convener, Keith W. Stewart Mackenzie of Seaforth.

Spey, Avon, and Fiddochside Association—Convener, Sir George Macpherson Grant, Bart.

Kilmarnock Club—Convener, Frederick J. Turner, the Dean.

Avondale Society—Convener, David Souter Robertson of Whitehill.

Dalbeattie Society—Convener, Wellwood H. Maxwell of Munches.

Black Isle Society—Convener, Major Wardlaw, Belmaduthy.
Fettercairn Club—Convener, Lieutenant-Colonel MacInroy of the Burn.
Mauchline Society—Convener, C. V. H. Campbell of Netherplace.
Cumnock Society—Convener,
Sanquhar Society—Convener, James Veitch of Eliock.
Leochel-Cushnie Society—Convener, Arthur Forbes Gordon of Rayne.
Caithness Society—Convener, Alexander Henderson of Stemster.

2. Wool.—For the best sample of the following wools :—

Laid Cheviot, washed.
Laid Cross, washed.
Laid Blackfaced, unwashed.
Hog, White Cheviot.
White Long.

The Silver Medal for each variety.

Applied for by the Inverness Farmers' Club, and subject to its conditions—Convener, Henry W. White of Monar.

3. For the best managed Farm—The Silver Medal.

Applied for by the Nairnshire Society—Convener, Wm. Alexander Stables, Cawdor Castle.
Inverness Society—Convener, Arthur Forbes of Culloden.
Kincardineshire Club—Convener, Sir John S. Forbes, Bart.
Mauchline Society—Convener, C. V. H. Campbell of Netherplace.
Kilmarnock Club—Convener, Frederick J. Turner, the Dean.

4. For the best managed Dairy—The Silver Medal.

Applied for by the Mauchline Society—Convener, Colonel Ferrier Hamilton.
Kilmarnock Club—Convener, Frederick J. Turner, the Dean.

5. For the best managed Green Crop—The Silver.

Applied for by the Bute Society—Convener, James Muir, Barone Park.

Inverness Society—Convener, Arthur Forbes of Culloden.

Leochel-Cushnie Society—Convener, A. Forbes Gordon of Rayne.

Clackmannan Society—Convener, James Johnstone of Alva.

Fettercairn Club—Convener, Lieut-Colonel MacInroy of the Burn.

Mauchline Society—Convener, C. V. H. Campbell of Netherplace.

Kincardineshire Club—Convener, Sir John S. Forbes, Bart.

Kilmarnock Club—Convener, Frederick J. Turner, the Dean.

6. For the best managed HAY CROP—The Silver Medal.

Applied for by the Clackmannanshire Society—Convener, James Johnstone of Alva.

7. For the best kept FENCES—The Silver Medal.

Applied for by the Kilmarnock Club—Convener, Frederick J. Turner, the Dean.

8. To the most expert Hedge-cutter—The Silver Medal.

Applied for by the Kilmarnock Club—Convener, Frederick J. Turner, the Dean.

9. To the Labourer most expert and efficient in opening, laying, and filling Drains, and otherwise executing the works necessary in thorough Draining—The Silver Medal.

No Application.

10. For the best SWEET MILK CHEESE—The Silver Medal.

Applied for by the Cumnock Society—Convener,

Sanquhar Society—Convener, James Veitch of Eliock.

11. For the best CURED BUTTER—The Silver Medal.

Applied for by the Cumnock Society—Convener,

Sanquhar Society—Convener, James Veitch of Eliock.

12. For the best COLLECTION OF ROOTS—The Silver Medal.

Applied for by the Cumnock Society—Convener,

Sanquhar Society—Convener, James Veitch of Eliock.

13. For the best COLLECTION OF SEEDS—The Silver Medal.

Applied for by the Cumnock Society—Convener,

Sanquhar Society—Convener, James Veitch of Eliock.

The Medals to be issued will be limited to ten in each class, except No. 1.

The Money Premiums given in the District must be £2 in each case, and in No. 1, £10.

Reports of the several Competitions, and applications for Medals in 1865, must be lodged by 1st November next.

CLASS V.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned. The Medals and one-half of the Premiums are given by the Society, and the other half is contributed by the respective Parishes.

COTTAGES.

1. For the best kept Cottage in each Parish—One Pound Five Shillings; and where there are four Competitors—The Silver Medal.
2. For the second best—One Pound.
3. For the third best—Fifteen Shillings.

GARDENS.

1. For the best kept Cottage Garden in each Parish—One Pound Five Shillings; and where there are four Competitors—The Silver Medal.
2. For the second best—One Pound.
3. For the third best—Fifteen Shillings.

Aberdeenshire.

LEOCHEL-CUSHNIE—Convener, Arthur Forbes Gordon of Raync.
STRICHEN—Convener, George Baird of Strichen.

Edinburghshire.

CURRIE—Convener, The Right Hon. Sir William Gibson-Craig of Riccarton, Bart.
WEST-CALDER—Convener, Robert Steuart of Carfin.

Fifeshire.

NEWBURGH and ABDIE—Convener, Dr Lyell, Newburgh.

Stewartry of Kirkcudbright.

URR—Convener, Wellwood H. Maxwell of Munches.

Lanarkshire.

LAMINGTON—Convener, Alexander Baillie Cochrane of Lamington, M.P.

Lesmahagow—Convener, W. E. Hope Vere of Blackwood.
Douglas—Convener, Thomas Rennie Scott, Castle Mains.

Peeblesshire.

Broughton—Convener, James Tweedie of Quarter.

Perthshire.

St Martins—Convener, William Macdonald Macdonald of St Martins.

Roxburghshire.

Ancrum—Convener, Sir William Scott of Ancrum, Bart., M.P.

Wigtownshire.

Kirkcolm—Convener, David Guthrie, Stranraer.
Leswalt—Convener, Sir Andrew Agnew of Lochnaw, Bart., M.P.
Port-Patrick—Convener, Sir Edward Hunter Blair, Bart.
Old Luce—Convener, Sir John C. Dalrymple Hay of Park Place, Bart.
Stoneykirk—Convener, David Frederick, Dumbreddon.

CONDITIONS.

1. Competitions may take place in the different Parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Gentlemen's Lodges and Gardners' Houses, as well as Gentlemen's Servants occupying Cottages in the Policies, or on land in the natural possession of their masters, are excluded. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, shall not exceed £5 sterling. A Competitor who has gained a Premium in a previous year cannot compete again for the same or a lower Premium, but will be allowed a Medal if recommended by the Inspecting Committee.

4. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly—the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

5. In estimating the claims for the Garden Premiums, the Judges should have in view—the sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

6. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary on or before 1st of November next.

Parishes desirous of these Premiums must lodge applications with the Secretary on or before the 1st November next.

MEDALS FOR COTTAGES OR GARDENS.

The Society will issue annually twelve Medals to local Associations or individuals, who at their own expense establish Premiums for Cottages or Gardens.

The Medals will be issued upon a Report by a Member of the Society, in the terms required by the preceding conditions, describing the merits of the Cottages or Gardens. The Reports to be lodged with the Secretary on or before the 15th October 1864.

Applied for by

The Parishes of Forglen and Alvah.
The Mauchline Horticultural Society.
The Newburgh Gardening Society.
The Conan and Maryburgh Gardening Society.
The United East Lothian Society.
The Logiealmond and Glenalmond Horticultural Society.
Arthur Forbes Gordon of Rayne.
Archdeacon Bisset of Lessendrum.
Sir George Macpherson Grant, Bart.

IMPROVING EXISTING COTTAGES.

To the Proprietor in Scotland who shall report the Improvement of the greatest number of Cottages in the years 1861, 1862, and 1863—The Gold Medal.

BUILDING NEW COTTAGES.

To the Proprietor in Scotland who shall report the Erection of the greatest number of approved Cottages during the years 1860, 1861, 1862, and 1863—The Gold Medal.

CONDITIONS.

1. Claims for the above Premiums must be lodged with the Secretary on or before the 1st of October next, to allow an inspection to be made of the different Cottages. The inspection will be conducted by a Committee of the Society's Members, and Reports must be transmitted to the Secretary on or before the 1st November.

2. The annual value of the Cottage or Cottages separately, with the garden ground, must not exceed £5.

3. In estimating the claims of Competitors, the following points will be kept in view:—The external appearance of the Cottages; their internal accommo-

dation; the arrangements of the outhouses; the means of drainage and ventilation; and the expense of the building or of the alteration, compared with its durability and accommodation. When the Cottages of one Competitor are superior in style and comfort to those of another, though not so numerous, the Inspectors will give them the preference, provided they amount at least to three, and have been erected at a moderate expense.

4. Parties competing will forward to the Society Plans, Specifications, and Estimates, of which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

ACCOMMODATION FOR FARM-SERVANTS.

To the Proprietor in Scotland who shall have erected on his estate the most approved Farm-buildings in reference to the proper accommodation of Farm-servants—The Gold Medal.

Reports, Plans, and Specifications to be lodged by the 1st November 1864.

GENERAL SHOW OF STOCK AND IMPLEMENTS,

AT

STIRLING,

ON THE 1ST, 2D, 3D, AND 4TH OF AUGUST 1864.

HIS GRACE THE DUKE OF ARGYLL, K.T.,
President of the Society.

HIS GRACE THE DUKE OF MONTROSE, K.T.,
Chairman of the Local Committee.

The District connected with the Show comprises the Counties of STIRLING, DUMBARTON, and CLACKMANNAN, and the Western Division of PERTHSHIRE.

GENERAL ARRANGEMENTS.

STOCK.

To be entered with the Secretary on or before Friday, 17th June.
Received in the Yard on Saturday and Monday, 30th July and 1st August, and between 6 and 8 A.M. on Tuesday, 2d August.
Judged at 9 A.M. on Tuesday, 2d August.
Exhibited Tuesday, Wednesday, and Thursday, 2d, 3d, and 4th August.

IMPLEMENTS.

To be entered with the Secretary on or before Friday, 17th June.
Received in the Yard on Saturday, 30th July, and Monday, 1st August.
Exhibited Tuesday, Wednesday, and Thursday, 2d, 3d, and 4th August.

TERMINATION OF SHOW.

THURSDAY, 4th August, at 5 P.M. Stock and Implements may remain in the Yard till Friday afternoon.

The Competition is open to Exhibitors from all parts of the United Kingdom.

Members of the Society are exempted from entry-money of 2½ per cent. on premiums for Stock. They are admitted to the Show-Yard at half-price during the judging of Stock. At other periods they have free access.

PREMIUMS.

CLASS I.—CATTLE.

NOTE.—*The Medium Gold Medal will be given to any animal which has gained the Society's highest Premium at a former Show in the classes of aged Bulls, Cows, and Stallions.*

SECTION	SHORT-HORN.	
1	Best Bull calved before 1st Jan. 1862,	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
	Breeder of Best Bull, ...	The Silver Medal.
2	Best Bull calved after 1st Jan. 1862, .	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
3	Best Bull calved after 1st Jan. 1863, .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
4	Best Cow of any age, ...	Fifteen Sovereigns.
	Second best, ...	Eight Sovereigns.
	Third best, ...	The Bronze Medal.
5	Best Heifer calved after 1st Jan. 1862,	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
6	Best Heifer calved after 1st Jan. 1863,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
	POLLED (ABERDEEN OR ANGUS).	
7	Best Bull calved before 1st Jan. 1862,	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
	Breeder of Best Bull, ...	The Silver Medal.
8	Best Bull calved after 1st Jan. 1862,	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
9	Best Bull calved after 1st Jan. 1863,	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
10	Best Cow of any age, ...	Fifteen Sovereigns.
	Second best, ...	Eight Sovereigns.
	Third best, ...	The Bronze Medal
11	Best Heifer calved after 1st Jan. 1862,	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
12	Best Heifer calved after 1st Jan. 1863,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

POLLED (GALLOWAY).

Section		
13	Best Bull calved before 1st Jan. 1862,	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
	Breeder of Best Bull, ...	The Silver Medal.
14	Best Bull calved after 1st Jan. 1862,	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
15	Best Bull calved after 1st Jan. 1863,	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
16	Best Cow of any age, ...	Fifteen Sovereigns.
	Second best, ...	Eight Sovereigns.
	Third best, ...	The Bronze Medal.
17	Best Heifer calved after 1st Jan. 1862,	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
18	Best Heifer calved after 1st Jan. 1863,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

AYRSHIRE.

19	Best Bull calved before 1st Jan. 1862,	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
	Breeder of Best Bull, ...	The Silver Medal.
20	Best Bull calved after 1st Jan. 1862,	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
21	Best Bull calved after 1st Jan. 1863,	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
22	Best Cow in Milk of any age, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
23	Best Cow in Calf of any age, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
24	Best Heifer calved after 1st Jan. 1862,	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
25	Best Heifer calved after 1st Jan. 1863,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

HIGHLAND.

Section		
26	Best Bull calved before 1st Jan. 1861,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
	Breeder of Best Bull,	The Silver Medal.
27	Best Bull calved after 1st Jan. 1861,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
28	Best Bull calved after 1st Jan. 1862,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
29	Best Cow of any age,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
30	Best Heifer calved after 1st Jan. 1861,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
31	Best Heifer calved after 1st Jan. 1862,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.

FAT STOCK.

32	Best Ox of any Pure or Cross breed calved after 1st Jan. 1861,	Medium Gold Medal.
	Second best,	The Silver Medal.
	Third best,	The Bronze Medal.
33	Best Ditto, after 1st Jan. 1862,	Medium Gold Medal.
	Second best,	The Silver Medal.
	Third best,	The Bronze Medal.
34	Best Ditto, after 1st Jan. 1863,	Medium Gold Medal.
	Second best,	The Silver Medal.
	Third best,	The Bronze Medal.
35	Best Highland Ox calved after 1st Jan, 1860,	Medium Gold Medal.
	Second best,	The Silver Medal.
	Third best,	The Bronze Medal.
36	Best Ditto, after 1st Jan. 1861,	Medium Gold Medal.
	Second best,	The Silver Medal.
	Third best,	The Bronze Medal.
37	Best Cross Heifer calved after 1st Jan. 1862,	Medium Gold Medal.
	Second best,	The Silver Medal.
	Third best,	The Bronze Medal.

Section		
38	Best Ditto, after 1st Jan. 1863, . . .	Medium Gold Medal.
	Second best, ...	The Silver Medal.
	Third best, ...	The Bronze Medal.

CLASS II.—HORSES

FOR AGRICULTURAL PURPOSES.

1	Best Stallion foaled before 1st Jan. 1861, ...	Thirty Sovereigns.
	Second best, ...	Fifteen Sovereigns.
	Third best, ...	The Bronze Medal.
	Breeder of best Stallion, ...	The Silver Medal.
2	Best Entire Colt foaled after 1st Jan. 1861, ...	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
3	Best Entire Colt foaled after 1st Jan. 1862, ...	Fifteen Sovereigns.
	Second best, ...	Eight Sovereigns.
	Third best, ...	The Bronze Medal.
4	Best Entire Colt foaled after 1st Jan. 1863, ...	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
5	Best Mare (with foal at foot) foaled before 1st Jan. 1861, ...	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
6	Best Mare (in foal) foaled before 1st Jan. 1861, ...	Fifteen Sovereigns.
	Second best, ...	Eight Sovereigns.
	Third best, ...	The Bronze Medal.
7	Best Filly foaled after 1st Jan. 1861,	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
8	Best Filly foaled after 1st Jan. 1862,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
9	Best Filly foaled after 1st Jan. 1863,	Six Sovereigns.
	Second best, ...	Three Sovereigns.
	Third best, ...	The Bronze Medal.

CLASS III.—SHEEP.

LEICESTER.

Section		
1	Best Tup, not above four shear, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
2	Best Dinmont or Shearling Tup, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
3	Best five Ewes not above four shear, .	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
4	Best five Shearling Ewes or Gimmers,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

CHEVIOT.

5	Best Tup not above four shear, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
6	Best Dinmont or Shearling Tup, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
7	Best five Ewes not above four shear, .	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
	Best Pen of Lambs shown with Ewes,	The Silver Medal.
8	Best five Shearling Ewes or Gimmers,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

BLACKFACED.

9	Best Tup not above four shear, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
10	Best Dinmont or Shearling Tup, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
11	Best five Ewes not above four shear, .	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
	Best Pen of Lambs shown with Ewes,	The Silver Medal.
12	Best five Shearling Ewes or Gimmers,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

Section

SOUTHDOWN.

13	Best Tup not above four shear, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
14	Best Dinmont or Shearling Tup, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
15	Best Five Ewes not above four shear,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
16	Best five Shearling Ewes or Gimmers,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

LONG-WOOLLED OTHER THAN LEICESTER.

17	Best Tup not above four shear, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
18	Best five Gimmers or Ewes not above four shear, ...	Eight Sovereigns.
	Second, ...	Four Sovereigns.
	Third, ...	The Bronze Medal.

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

19	Best Tup not above four shear, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
20	Best five Gimmers or Ewes not above four shear, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

CLASS IV.—SWINE.

Section

1	Best Boar, large breed, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
2	Best Boar, small breed, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
3	Best Sow, large breed, ...	Six Sovereigns.
	Second best, ...	Three Sovereigns.
	Third best, ...	The Bronze Medal.

Section		
4	Best Sow, small breed,	Six Sovereigns.
	Second best,	Three Sovereigns.
	Third best,	The Bronze Medal.
5	Best Pen of three Pigs, not exceeding 8 months old, large breed,	Four Sovereigns.
	Second best,	Two Sovereigns.
	Third best,	The Bronze Medal.
6	Best Pen of three Pigs, not exceeding 8 months old, small breed,	Four Sovereigns.
	Second best,	Two Sovereigns.
	Third best,	The Bronze Medal.

CLASS V.—EXTRA STOCK.

ANIMALS not included in the Competing Sections may be entered as EXTRA STOCK, and will receive HONORARY PREMIUMS when specially commended.

CLASS VI.—POULTRY.

COLOURED DORKING.

Section		
1	Best Cock and 2 Hens,	The Silver Medal.
	Second best,	The Bronze Medal.
2	Best Cockerel and 2 Pullets,	The Silver Medal.
	Second best,	The Bronze Medal.

WHITE DORKING.

3	Best Cock and 2 Hens,	The Silver Medal.
	Second best,	The Bronze Medal.
4	Best Cockerel and 2 Pullets,	The Silver Medal.
	Second best,	The Bronze Medal.

COLOURED COCHIN-CHINA.

5	Best Cock and 2 Hens,	The Silver Medal.
	Second best,	The Bronze Medal.
6	Best Cockerel and 2 Pullets,	The Silver Medal.
	Second best,	The Bronze Medal.

WHITE COCHIN-CHINA.

7	Best Cock and 2 Hens,	The Silver Medal.
	Second best,	The Bronze Medal.
8	Best Cockerel and 2 Pullets,	The Silver Medal.
	Second best,	The Bronze Medal.

SECTION

BRAMAHPOOTRA.

9	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
10	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

MALAY.

11	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
12	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

SPANISH.

13	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
14	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

GOLDEN HAMBURG.

15	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
16	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

SILVER HAMBURG.

17	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
18	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

POLISH.

19	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
20	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

GAME.

21	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
22	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

SECTION

ANY OTHER BREED.

23	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
24	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

BANTAMS.

25	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
26	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

CAPONS—*Of any Breed.*

27	Best 3 Capons, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

DUCKS—*White Aylesbury.*

28	Best Drake and 2 Ducks, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

DUCKS—*Rouen.*

29	Best Drake and 2 Ducks, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

DUCKS—*Any other Breed.*

30	Best Drake and 2 Ducks, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

TURKEYS—*Black Norfolk.*

31	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

TURKEYS—*Any other Breed.*

32	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

GEESE.

33	Best Gander and 2 Geese, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

CLASS VII.—IMPLEMENTS.

Note.—Premiums for Implements and Machinery have been withdrawn, and trials, during the currency of a Show, discontinued, in terms of a report approved of by a General Meeting of the Society on 21st January 1863. Reference is made to General Regulations 32, 33, and 34, for the terms on which Implements may now be exhibited, and for the period at, and the conditions under which they will be tried and rewarded.

REGULATIONS.

GENERAL CONDITIONS.

1. Members of the Society are admitted to the Show-Yard without payment on exhibiting a "*Member's Ticket*," except during the inspection by the Judges, when 5s. will be charged. Tickets will be sent to all Members residing in the District connected with the Show—the counties of Stirling, Dumbarton, and Clackmannan, and the Western division of Perthshire. Members residing in other localities must apply for Tickets at the Secretary's Office, 6 Albyn Place, Edinburgh, *not later than the 23d of July*.

2. Stock must be the property, and in the possession of the Exhibitor from the date of the Certificate of Entry, and the exact age must be stated in the Certificate.

3. Stallions and aged Bulls must have had produce, and must have served, within the year of the Show; two-year-old Bulls must have served within that year.

4. All Cows must have had calves previous to the Show, and when exhibited, they must either be in milk or in calf; if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 4 months after the Show.

5. Two-year-old Heifers, of the Short-horn and Polled breeds, must be in calf when exhibited, and birth must be certified within 9 months after the Show.

6. Mares in Section 5 must have produced foals after 1st January 1864, and foals must be at foot, except when death can be proved. Mares in Section 6 must be in foal, and awards will be suspended till birth is certified.

7. Ewes and Gimmers must be taken from regular breeding flocks. All Ewes must have reared Lambs in 1864, and Ewes in Sections 7 and 11. (Cheviot and Black-faced) must be in milk, and have their lambs at foot.

8. An animal which has gained a first premium at a General Show of the Society cannot again compete in the same class.

9. No animal shall bear on its rug, harness, pail, or other fittings, any

initial, crest, or mark of ownership, nor be distinguished otherwise than by the number indicating its place in the Catalogue.

10. Except for extra Stock, Commendations will only be given for one lot in each Section—the fourth in merit.

11. The violation by an Exhibitor of any one of the Regulations will involve the forfeiture of all Premiums awarded to him.

12. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, the case shall be reported to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a Member, struck from the roll.

13. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it and the grounds thereof, in his entry, to enable the Directors to judge of its validity.

14. Protests against the awards of the Judges must be lodged with the Secretary not later than 10 A.M. on Wednesday, 3d August, and parties must be in attendance at the Committee-Room, in the Show-Yard, at 12, when protests will be disposed of.

15. The Society shall not be liable for any loss or damage which Stock, Implements, or other articles may sustain at the Show, or in consequence of having been sent to it.

16. The decisions of the Judges, as confirmed by the Directors, are final, and no appeal is competent.

17. The Premiums awarded will be paid after the 1st November 1864, and may be taken either in money or in plate.

CERTIFICATES OF ENTRY FOR STOCK.

18. Every lot must be intimated by a Certificate of Entry lodged with the Secretary *not later than Friday the 17th of June.* Printed forms will be issued on application to the Secretary, or to the local Secretary, John M. Cunningham, Esq., writer, Stirling.

19. Admission-orders to the Yard for Stock and Servants will be forwarded by post previous to the Show.

ENTRY-MONEY FOR STOCK.

20. Exhibitors, not Members of the Society, shall pay as Entry-Money for each lot of Stock 2½ per cent. on the highest Premium for which the Entry is made. Members may show three lots of Stock in each Section free, but must pay the same percentage on the premium for each additional lot. The Entry-Money for Poultry is 2s. 6d. on each lot, and Members may show two lots free in each Section.

STALL RENT.

21. Covered accommodation will be provided for the whole of the Stock, and the following rates shall be paid by *all* Exhibitors at the time of making their Entries:—

	s.	d.
Stallions—3 year old—and 2 year old Entire Colts......	10	0
All other Horses and Cattle 2 years old and upwards....	7	6
Yearling Colts, Fillies, Bulls, and Heifers..................	5	0
Sheep and Swine, per pen....................................	5	0
Poultry, per coop...	2	6

ADMISSION OF STOCK.

22. The Yard will be open for Stock on Saturday 30th July and Monday 1st August, and between Six and Eight o'clock on the morning of the 2d.

23. One Servant will be admitted in charge of each lot. Bulls must be secured by a nose ring, with chain or rope attached.

24. No Exhibitor shall be permitted to remove Cattle, Sheep, or Swine from the Yard till Five P.M. on Thursday 4th August, except on certificate by the Veterinary Surgeon employed by the Directors.

25. Horses may be withdrawn at Six each evening on a deposit of £2 for each animal, which shall be forfeited if the animal is not brought back at Seven o'clock the following morning.

26. Servants in charge of Stock must bring their own buckets or pails. A first bedding for Horses, Cattle, and Swine will be provided by the Society, but all other fodder and food for Stock will be supplied, at fixed prices hereafter to be published, by a Contractor employed by the Society. Any Servant removing bedding from an adjoining stall will be fined in double the amount taken.

PLACING AND JUDGING STOCK.

27. The Judges will commence their inspection at Nine o'clock on Tuesday. 2d August; and till then, only Servants in charge of Stock will be allowed to remain in the Yard. There shall be no award unless the Judges deem the animals to have sufficient merit, more especially if there is only one lot in the Section; and it shall be in their power to suggest the removal of any lot which appears to them unworthy of being placed in the Yard.

28. A Member of Committee will attend each Section of the Judges. It will be his duty to see that no obstruction is offered to them, and that the space reserved for them is not encroached on; to communicate to the Secretary any question that may arise for the consideration of the Committee; to complete their reports; and to ticket the prize animals.

29. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or Attending Member in any class in which he is competing; and no Exhibitor shall remain in charge of any lot, whether belonging to himself or another, while the Judges are in the Yard.

ADMISSION OF PUBLIC.

30. The public will be admitted to the Stock-Yard on Tuesday at 9 A.M., immediately after the Judges have been conducted to their several stations, and before the inspection commences. Holders of Members' Tickets, and Exhibitors of Stock will be charged 5s. for admission to the judging; all others 10s. The space reserved for the judges will be enclosed by ropes, and no encroachment will be permitted.

31. After 2 P.M. on Tuesday, Holders of Members' Tickets will be admitted free. The charges to others will be,

TUESDAY after 2 P.M., Half-a-crown.

WEDNESDAY, from 8 A.M. till 1 P.M., Half-a-crown; and after 1, a Shilling.

THURSDAY from 8 A.M. till 5 P.M., a Shilling.

The Implement-Yard will be open on Tuesday forenoon while the Stock is being judged. Holders of Members' Tickets admitted free; others at 2s. 6d.; thereafter one Payment admits to both Yards.

ENTRY OF IMPLEMENTS.

32. All articles must be entered with the Secretary on or before 17th June, and Exhibitors must intimate whether they wish their goods placed under cover or not, and specify the space they require. The price of shedding, per lineal foot of frontage, with a depth of 20 feet, shall be 1s. 6d. to Members, and 2s. to Non-members.

33 Members may show Implements free if shedding is not required, and Non-members will be charged according to space occupied.

34. When an Implement or Machine is supposed to embrace a new invention, or radical improvement, the nature of such must be specified in the entry, to enable the Directors to order an inspection with a view to a trial. Such trial, when recommended by the inspecting Committee, will be instituted in a convenient locality, and at a season of the year suitable for the operation of the implement or machine, which, when thoroughly tested, will be entitled to such a Premium as the Directors may see fit to award, on the report of the Judges employed by them.

PLACING IMPLEMENTS IN THE YARD.

35. The Yard will be open for the reception of Implements on Saturday 30th July, and Monday 1st August, and the public will be admitted at 10 A.M. on the 2d.

36. There must be attached to each Implement, when forwarded to the Show, a label, bearing the Exhibitor's name, and that of the Implement.

37. The articles of each Exhibitor will be all placed in one stand.

38. All articles must remain in the Yard till Five P.M. on Thursday the 4th August, and may be kept there till the afternoon of Friday.

PLACING AND JUDGING POULTRY.

39. Poultry must be brought to the Show-Yard on Monday 1st August, or on the morning of the 2d. No lot will be admitted without an Admission-order. Coops, food, and attendance will be found by the Society.

40. No lot to be removed from the Yard till Five o'clock on Thursday the 4th August.

Premium Lists, Certificates of Entry, and Regulations, may be obtained by applying at the Secretary's Office, No. 6 Albyn Place, Edinburgh, or to JOHN M. CUNNINGHAM, Esq., writer, Stirling.

The Secretary will attend at Stirling on Thursday and Friday, 16th and 17th June, to close the entries.

GENERAL SHOW OF STOCK AND IMPLEMENTS,

At INVERNESS, in 1865.

The District connected with the Show will comprise the Counties of INVERNESS, MORAY and NAIRN, ROSS and CROMARTY, CAITHNESS, SUTHERLAND, and ORKNEY.

Premiums will be offered for the following Classes:—

CATTLE.

SHORT-HORN.

Bulls calved before 1st January 1863
Bulls calved after 1st January 1863
Bulls calved after 1st January..1864
Cows of any age.
Heifers calved after 1st January.....................................1863
Heifers calved after 1st January.....................................1864

HIGHLAND.

Bulls calved before 1st January 1862
Bulls calved after 1st January..1862
Bulls calved after 1st January...................... 1863
Cows of any age.
Heifers calved after 1st January.....................................1862
Heifers calved after 1st January..... 1863

POLLED—ANGUS, ABERDEEN, AND GALLOWAY.

Bulls calved before 1st January 1863
Bulls calved after 1st January 1863
Bulls calved after 1st January..1864
Cows of any age.
Heifers calved after 1st January.....................................1863
Heifers calved after 1st January 1864

AYRSHIRE.

Bulls calved after 1st January 1862
Cows in Milk of any age.
Cows in Calf of any age.
Heifers calved after 1st January.. 1863

EXTRA STOCK.

Oxen of any pure or cross breed calved after 1st January ...1862
Oxen of any pure or cross breed calved after 1st January ...1863
Oxen of any pure or cross breed calved after 1st January ...1864
Highland Oxen calved after 1st January 1861
Highland Oxen calved after 1st January 1862
Cross-bred Heifers calved after 1st January.....................1863
Cross-bred Heifers calved after 1st January.....................1864

HORSES

For Agricultural Purposes.

Stallions foaled before 1st January................................1862
Entire Colts foaled after 1st January........................ 1862
Entire Colts foaled after 1st January........................ 1863
Entire Colts foaled after 1st January...... 1864
Mares with foal at foot, foaled before 1st January 1862
Mares in fool, foaled before 1st January 1862
Fillies foaled after 1st January 1862
Fillies foaled after 1st January 1863
Fillies foaled after 1st January 1864

PONIES.

Stallions not exceeding 14 hands.
Mares not exceeding 14 hands.

SHEEP.

LEICESTER.

Tups not more than four shear.
Dinmont or Shearing Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

CHEVIOT.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

BLACKFACED.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

SOUTHDOWN.

Tups not more than four shear.
Ewes not more than four shear, or Gimmers.

LONG-WOOLLED OTHER THAN LEICESTER.

Tups not more than four shear.
Ewes not more than four shear, or Gimmers.

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

Tups not more than four shear.
Ewes not more than four shear, or Gimmers.

EXTRA.

Shearling Wethers of any cross.
Lambs of any cross.

NOTE.—*Ewes and Gimmers to be exhibited in pens of five, and in the Cheviot and Blackfaced Breeds, Ewes must be in milk with lambs at foot.*

SWINE.

Boars, large breed.	Sows, large breed.
Boars, small breed.	Sows, small breed.

Pigs not exceeding 8 months old, large breed.
Pigs not exceeding 8 months old, small breed.

POULTRY.

COCK and TWO HENS, COCKEREL and TWO PULLETS, of the following breeds:—

Coloured Dorking.	Game.
White Dorking.	Any other Breed.
Coloured Cochin China.	Bantams.
White Cochin China.	White Aylesbury Ducks.
Bramahpootra.	Rouen Ducks.
Malay.	Any other Breed.
Spanish.	Black Norfolk Turkeys.
Golden Hamburg.	Any other Breed.
Silver Hamburg.	Geese.
Polish.	Capons (coops of three).

AGRICULTURAL EDUCATION.

The following Bye-Laws have been enacted under the authority of the Supplementary Charter of 1856, and in terms of the Report by the Council on Education thereby created:—

1. That in terms of a Report by the Council on Education, the following Board of Examiners be appointed:—

Science and Practice of Agriculture—Mechanics and Construction—Professor WILSON; GEORGE HOPE, Fenton Barns; ROBERT RUSSELL, Pilmuir; and JOHN WILSON, Edington Mains.
Botany—Professor BALFOUR.
Chemistry—Professor ANDERSON.
Natural History—Professor ALLMAN.
Veterinary Surgery—Professor DICK.
Field Engineering and Surveying—JOHN MILLER of Leithen, C.E., and JAMES STIRLING, C.E.
Book-keeping and Accounts—KENNETH MACKENZIE, C.A., and PETER M'LAGAN of Pumpherston.

2. That it shall be competent for said Board from time to time to receive for examination, and to recommend for the Society's Agricultural Diploma, Candidates who shall have attained their 21st year, and who shall exhibit the vouchers, and pass an examination on the subjects hereinafter prescribed.

3. That the vouchers to be exhibited shall be such as to afford satisfactory evidence to the Board: *1st*, That the Candidate has attended a farm, and been engaged in the practical operations thereof, for a period of two years, or for two separate periods of not less than one year each. *2dly*, That the Candidate has attended, for another period of two years, or for separate periods of not less than one year each, the following Classes in some seminary recognised by the Board as sufficient:—Agriculture, Botany, Chemistry, Natural History, Veterinary Medicine and Surgery.

4. That the Candidate's knowledge of practical husbandry, and of the foregoing branches of study, as well as of Field Engineering and Surveying, Farm Mechanics and Architecture, and Book-keeping, shall be established to the satisfaction of the Board by means of a strict examination.

5. That upon a report made by the Board to the Council on

Education, stating that a Candidate has exhibited the vouchers and passed the examination required, the Council shall issue, in favour of such Candidate, a diploma, bearing the corporate seal of the Society, and certifying his proficiency in the arts and sciences connected with agriculture.

VETERINARY COLLEGE.

This establishment is conducted by Professor Dick, assisted by Dr Allen Dalzell, Dr Young, Mr Strangeways, and Mr Worthington. The curriculum embraces the Principles and Practice of Veterinary Medicine and Surgery, with Anatomy, Physiology, and Demonstrations; Chemistry; Materia Medica and Dietetics; and the general management of domesticated Animals.

Students have the advantage of assisting in an extensive practice, and of performing the different operations which most frequently occur.

Attendance on Two Courses is required before a Student is taken upon trial for diploma; the examinations are conducted by leading members of the Medical Faculty, and of the Veterinary Profession; Graduates of the College are eligible for appointment as Veterinary Surgeons in Her Majesty's Service.

The Session commences in the beginning of November, and is concluded before the end of April following.

MUSEUM.

The Museum, George IV. Bridge, is open from eleven till four o'clock every day, except Monday. The public are admitted on inscribing their names in the Visitor's Book. Persons desirous of preserving objects illustrative of the Vegetable products of the country are invited to transmit them to the Secretary.

CHEMICAL DEPARTMENT.

The objects of the Chemical Department are twofold:—

I. The prosecution of Researches in various subjects connected with Agricultural Chemistry, the results of which are published at intervals in the Transactions.

Dr Anderson will be glad at all times to receive suggestions from Members of the Society regarding subjects they may consider worthy of investigation, and which will be laid before the Chemical Committee.

II. The performance of Analyses of Manures, Soils, Vegetable Products, &c., for Members of the Society at reduced fees.

In purchasing manures, cattle foods, &c., Members are recommended, in all cases, to do so by guaranteed analysis, and to ascertain that the article delivered corresponds with it. Partial analyses, such as Nos. 6 and 7 of the accompanying List, will generally suffice to check the correspondence of the stock with the guarantee, and give an *approximate*, though not a precise estimate of its value. When an *exact* estimate is required, a complete analysis is necessary.

Samples intended for analysis should be sent (carriage paid) addressed to Dr ANDERSON, 15 SHUTTLE STREET, GLASGOW, and when of small size, they are most cheaply and expeditiously forwarded *by post*. They should be distinctly labelled, marked with the name and address of the sender in full, and accompanied by a letter, specifying the particular analysis required, according to its number in the following List,—and, if possible, the object in view,—as, by doing so, much trouble and delay will occasionally be saved.

Much inconvenience having been experienced by persons sending samples for Analyses which had not been selected with sufficient care, and were afterwards found not to represent the average composition of the substance, it is particularly requested that the following instructions may be attended to as closely as circumstances will permit:—

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

Manures.—A large double handful of the Manure should be taken from each of *at least* five or six different bags; and if any lumps are found in it, a due proportion of these should also be taken. The whole being laid on a large sheet of paper, should be carefully mixed by rubbing with the hand, the lumps being broken

down and mixed as uniformly as possible with the powdery part. If this mixture be carefully made, a quantity of it not exceeding *two ounces* will suffice for the analysis. It should be folded up in tinfoil to prevent its becoming dry, and is most cheaply and expeditiously forwarded by post. In default of tinfoil, the sample may be wrapped in double folds of strong writing paper. Should the manure contain stones, or be very moist, or should any difficulty be experienced in making a uniform mixture, it is desirable that *two or three pounds* should be sent.

Soils.—In selecting Soils for analysis, five or six spadefuls should be taken from different parts of the field, and, after being spread out in a thin layer for several days to dry, should be put two or three times through a fine sieve, so as to insure uniform mixture. For a complete analysis, not less than *two pounds* should be sent: for a partial analysis, three or four ounces will be sufficient.

Waters.—For the complete analysis of a Water, from *two to three gallons* are required; for the determination of the amount of salts in solution, and lime thrown down by boiling, *two quarts* will suffice. A well-water may be selected at any time; but the water of a spring or running stream should be taken in dry weather. The jars or bottles in which they are sent must be tightly corked and sealed. In the analysis of a mineral water, it may sometimes be desirable to determine the amount of gases held in solution; in which case certain precautions must be observed which require the presence of a chemist at the spring.

Limestones, Clays, Ironstones, &c.—If the bed of any of these substances of which the analysis is required be very uniform in appearance, a piece of two or three ounces weight, taken from any part of it, will be enough for analysis; but in all cases it is better to send three or four chips from different parts of its thickness. Sometimes, where the characters of different parts of the bed vary much, separate analyses of these portions may be requisite, in which case two ounces of each may be sent.

The following are the rates at which Analyses, &c., are furnished to *Members of the Society*, and it is requested that the fee be remitted along with the sample:—

1. Complete analysis of a Soil, including determination of Alkalies and Phosphates, £3.
2. A partial analysis of a Soil, such as the determination of the quantity of Organic Matter, and relative proportion of Clay, Sand, and Carbonate of Lime it contains, 10s.
3. Quantitative determination of any one ingredient of a Soil, 7s. 6d.
4. Complete analysis of Saline Manures and other substances,

such as Gypsum, Nitrates of Soda and Potash, Ammoniacal Salts, Guano, Oil-cake, Bone-dust, Rape-dust, Superphosphate of Lime, £1.

5. Testing the above substances for adulterations,—for each sample, 5s.

   This examination is generally sufficient to determine whether or not any of these substances are grossly adulterated, but it gives no idea of the comparative value of different Samples, where all are genuine.

6. Determination of the percentage of Phosphates and Ammonia in a Guano, 10s.

7. Determining the quantity of Soluble and Insoluble Phosphates in a Superphosphate, 10s.

   This and the preceding determination generally suffice to show whether the sample is of fair quality, and corresponds with the analysis by which it was sold, but not to fix its exact commercial value.

8. Complete analysis of Limestones, Marl, Shell-sands, &c., £1.

9. Examining any of the above substances for the quantity of Lime, and ascertaining in the same the presence of Magnesia and Alumina, 7s. 6d.

   Ascertaining the proportion of these, 2s. 6d. additional for each substance.

10. Complete analysis of the Ashes of any Plant, £3.

11. Complete analysis of a Water, £2.

12. Determination of the amount of Salts in Solution, and of the Lime thrown down by boiling in any water, 10s.

13. Analysis of Tile or Fire Clay, £1. 10s.

14. Complete analysis of Roots, Grains, and other Vegetable Products, £1.

15. Examining products of Vegetation, or of the Dairy, such as Nutritive Matters in Wheat, or other grain—quantity of Butter or Cheese in Milk—5s. for each ingredient.

16. Determination of the quantity of Nitrogen in any substance, 7s. 6d.

17. Answers to letters asking advice on subjects within the department of the Chemist, 5s.

The charges for other Analyses not specified in the list will be settled by the Committee of Management, with reference to the amount of work which they involve, and a scale similar to the above.

J^N. HALL MAXWELL, *Secretary.*

EDINBURGH, 6 ALBYN PLACE,
3d February 1864.

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

IN

1865.

CONTENTS.

PRELIMINARY NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and established by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of Agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have, for the greater part of a century, been directed to the promotion of the science and practice of Agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are awarded for Reports on almost every subject connected with the cultivation of the soil; the rearing and feeding of stock; the management of the dairy; the growth of timber; the extension of cottage accommodation; the improvement of agricultural machinery and implements; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society, are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal Towns of Scotland, at which

Exhibitors from all parts of the United Kingdom are allowed to compete.

2. A System of District Shows, instituted for the purposes of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The promotion of Agricultural Education, under powers conferred by a Supplementary Royal Charter granted in 1856, and authorising "The COUNCIL of the HIGHLAND AND AGRICULTURAL SOCIETY on EDUCATION" to grant Diplomas to Students of Agriculture (see p. 63).

4. The advancement of the Veterinary Art, by conferring Diplomas on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise.

5. The appointment of a Chemist for the purpose of promoting the application of science to Agriculture. Investigations on subjects of importance are conducted in the Laboratory, and published in the Transactions. Members can obtain analyses, reports, and advice, on terms below those charged to others (see p. 66).

6. The establishment of an Agricultural Museum, illustrative of the vegetable products of the country.

7. The periodical publication of the Transactions, which comprehend the proceedings in the Laboratory, reports of experiments, and other communications addressed to the Society. The Transactions are published by Messrs WM. BLACKWOOD & SONS, Edinburgh, and may be obtained by Members of the Society, separately, at the reduced price of 4s. annually, or conjoined with Messrs Blackwood's Journal of Agriculture, for 8s.

CONSTITUTION AND MANAGEMENT.

The general business of the HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of a Royal Charter, which authorises the enactment of Bye-Laws. Business connected with Agricultural Education is conducted under the authority of a Supplementary Royal Charter, also authorising the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Ten Extraordinary, and Thirty Ordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers. The proceedings of the Directors are reported to General Meetings of the Society, held in January, and in June or July. The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Eleven Members.

Members are elected at the half-yearly General Meetings. The ordinary subscription is £1, 3s. 6d. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £12, 12s. to £7, 1s. Tenant-Farmers, Secretaries and Treasurers of local Agricultural Associations, resident Agricultural Factors, and Proprietors farming the whole of their own lands whose valuation does not exceed £500, are admitted on a subscription of 10s. annually, or £5, 5s. for life.

Members of the Society are entitled to apply for District Premiums,—to report Ploughing Matches for the Medal,—to attend Shows and exhibit Stock free of charge,—to consult the Chemist at reduced rates,—and to obtain the Transactions at a modified price.

Orders, payable at the Royal Bank of Scotland, are issued by the Directors, in name of the parties in whose favour Premiums have been awarded.

All communications must be addressed to "JOHN HALL MAXWELL, Esq., C.B., Secretary of the Highland and Agricultural Society of Scotland, No. 6 Albyn Place, Edinburgh."

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Council on Education.

By a Supplementary Chapter under the Great Seal, granted in 1856, the Society is empowered to prescribe a Curriculum for Agricultural Education, and to grant Diplomas.

Members of Council named by Charter.

The Duke of Argyll, *President.* The Lord Justice-General, *Vice-President.*

The Lord Advocate.
The Dean of Faculty.
The Professor of Agriculture.
The Professor of Anatomy.
The Professor of Botany.
The Professor of Chemistry.
The Professor of Natural History.

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Sir W. Gibson-Craig, Bart.
Sir Alexander C. Gibson Maitland, Bart.
George Hope, Fenton Barns.
Robert Russell, Pilmuir.
Henry Stephens, Redbraes Cottage.
John Wilson, Edington Mains.

Board of Examiners.

Science and Practice of Agriculture—Mechanics and Construction—Professor Wilson; George Hope, Fenton Barns; Robert Russell, Pilmuir; and John Wilson, Edington Mains.

Botany—Professor Balfour.

Chemistry—Professor Anderson.

Natural History—Professor Allman.

Veterinary Surgery—Professor Dick.

Field Engineering and Surveying—Professor Macquorn Rankine.

Book-Keeping and Accounts—Kenneth Mackenzie, C.A., and Peter M'Lagan of Pumpherston.

Museum,

GEORGE IV. BRIDGE, OPEN TO THE PUBLIC FROM 11 TO 4 EVERY DAY, EXCEPT MONDAY.

PREMIUMS.

GENERAL REGULATIONS FOR COMPETITORS.

ALL Reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter similarly marked, containing the name and address of the Reporter; initials must not be used.

No sealed letters, unless belonging to a report found entitled to one-half of the Premium offered, will be opened without the Author's consent.

Reports, for which a Premium, or one-half of it, has been awarded, become the property of the Society, and cannot be published, in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the Author if applied for within twelve months.

When a Report is unsatisfactory, the Society is not bound to award the whole, or any part of a premium.

All Reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded. Weights and measurements must be indicated by the imperial standards.

The decisions of the Board of Directors are final and conclusive as to all premiums, whether for Reports, or at general or district Shows, and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

Reports on subjects not included in the Premium list will be received, and honorary rewards will be given, when merited.

CLASS I.

REPORTS.

Section 1.—ON SUBJECTS CONNECTED WITH THE SCIENCE AND PRACTICE OF AGRICULTURE.

1. DIETARIES OF SCOTCH AGRICULTURAL LABOURERS.

For an approved Report on the Dietaries of Scotch Agricultural Labourers, stating, in selected instances over different districts of the country, the actual weight of each kind of food consumed in a week by the labourer and his family, with suggestions for improvement in the dietaries and mode of cooking —Twenty Sovereigns.

Reports to be lodged by 1st November 1866.

2. AGRICULTURE OF ABERDEENSHIRE AND BANFFSHIRE.

For an approved Report on the Agriculture of Aberdeenshire and Banffshire—Thirty Sovereigns.

The Report should embrace full details of the different systems of farm management observed in the district, and of the progress which Agriculture has made within the last 25 years.

Reports to be lodged by 1st November 1865.

3. AGRICULTURE OF PERTHSHIRE.

For an approved Report on the Agriculture of Perthshire—Thirty Sovereigns.

The Report should embrace full details of the different systems of farm management observed in the district, and of the progress which Agriculture has made within the last 25 years. Particular reference must be made to the system followed in the Carse districts of the county.

Report to be lodged by 1st November 1865.

4. EFFECT OF SPECIAL MANURES OVER A ROTATION.

For an approved Report, to be made after a rotation, on the comparative effects, immediate and continued, of different special Manures—Thirty Sovereigns.

As the object of the premium is to encourage experiments for determining the value of various applications, as regards not only increased quantity and improved quality of crops, but also the permanence of the different substances throughout the rotation, the Report must have reference to points such as specific gravity and quality of turnips—weights of grain, straw, and hay—effects on straw and hay for fodder, and such like. The result obtained from each application to be compared with those of the ordinary manuring of the farm. Each experiment to be conducted on not less than one rood of land, and the exact composition of the special manures used must be given.

Reports to be lodged by 1st November in any year.

5. PHOSPHATIC AND AMMONIACAL MANURES.

For an approved Report on the different effects of Phosphatic manures and Ammoniacal manures, and of a mixture of these substances, when applied to the raising of early and late sown turnips—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1866.

6. MINERAL AND ANIMAL PHOSPHATES.

For an approved Report on the comparative effects of Phosphates derived from animal and mineral sources—The Gold Medal, or Ten Sovereigns.

The experimenters are recommended to compare the effects of ground bones with a mixture of bone-ash, and of coprolites or apatite, with sulphate of ammonia in such proportion as shall be equivalent to the ammonia contained in the bones. Similar experiments should be made on the same principle with dissolved bones and dissolved mineral phosphates.

Reports to be lodged by 1st May 1866.

7. LARGE AND SMALL PLOT EXPERIMENTS.

For an approved Report on a series of experiments made on large and small plots for the purpose of determining the relative accuracy of the results obtained from them.—The Gold Medal, or Ten Sovereigns.

The large plots may be from 1 acre to $\frac{1}{4}$ of an acre, and it is recommended that the small plots should be $\frac{1}{112}$ of an acre, when each lb. of manure applied to the plot will be equal to 1 cwt. on the acre. All the experiments must be made in duplicate —that is to say, two large and two small plots for each manure, and unmanured plots should also be left for comparison. The experiments may be made with Peruvian guano, dissolved bones, dissolved bone-ash, or other light manures, and either on turnips or cereals. In the latter case, it is recommended that the plots should be surrounded by galvanised iron wire, stretched between pins at the corners of the plots, so that the crop on each may be kept quite distinct.

Reports to be lodged by 1st May 1866.

8. MANURES PRODUCED BY DIFFERENT KINDS OF FEEDING.

For an approved Report of the result of experiments for ascertaining the comparative value of farm-yard manure obtained from cattle fed upon different varieties of food, by the application of such manures to farm crops—Twenty Sovereigns.

The Report must state the effects produced on two successive crops by the application of manure obtained from cattle fed on different sorts of food, such as turnips and straw alone; and turnips and straw, with an addition of oil-cake, linseed, bean-meal, grain, or other substances. The animals should be as nearly as possible of the same age, weight, condition, and maturity, and each lot should receive daily the same quantity of litter; and, except as to the difference of food, they must be treated alike.

The preparation of the manure, by fermentation or otherwise, should be in every respect the same; and it is desirable that not less than two several experiments be made with each kind, and that the ground to which it is to be applied be as equal as possible in quality and condition.

Reports to be lodged by 1st May in any year.

9. MANURE MADE WITH AND WITHOUT COVER.

For an approved Report on the comparative value of Manure made in the ordinary manner, and of Manure kept under cover till applied to the land—Twenty Sovereigns.

The experiment may be conducted either with manure made in the open strawyard, contrasted with that made in covered hammels or boxes, or with manure made in feeding-houses, part of which

shall have been placed under cover, and part removed to the open dung-pit, and kept carefully unmixed with any other manure. Preference will be given to experiments embracing both of these modes. The cattle must be fed and littered alike. There must be at least an acre of land experimented on with each sort of manure—the different lots must be manured to the same extent, and be equal in soil, and the crops must be accurately weighed and measured on two separate portions of each lot, not less than 20 poles. The result, as given by two successive crops, to be reported.

Reports to be lodged by 1st May in any year.

10. TOP-DRESSING FOR CEREALS.

For an approved Report on the substances which may be most profitably employed in top-dressing Cereal Crops—The Gold Medal, or Ten Sovereigns.

The report must state the nature of the substances used, the time and cost of the application, and the comparative results, which must be contrasted with those obtained from a portion of the same field to which no top-dressing was applied.

Reports to be lodged by 1st November 1866.

11. AUTUMN MANURING.

For an approved Report on the comparative advantages of applying Manure to the stubble in Autumn, or in the drills in Spring for turnips, potatoes, or beans—Twenty Sovereigns.

The experiment must extend over two years, and comprise a green crop and a grain crop. It must be conducted on not less than four acres—one-half of which shall be dunged in autumn, and the other in spring, with manure made as nearly as possible in the same way, and of equal quantity and quality. The treatment and condition of the land prior to the experiment must be mentioned.

As the object of this premium is to determine the comparative advantages of autumn manuring, there will be no restriction as to labouring the land, but the Reporter must state how that was done on each lot during the experiment, which, if possible, should be repeated in duplicate.

Reports to be lodged by 1st May 1866.

12. IMPROVED VARIETIES OF AGRICULTURAL PLANTS.

For an approved Report on the means successfully employed for obtaining new and superior varieties, or improved sub-va-

rieties of any of the cereal grains, grasses, roots, or other agricultural plants—The Gold Medal, or Ten Sovereigns.

It is necessary that the varieties and sub-varieties reported upon shall have been proved capable of reproduction from seed, and also that the relation they bear to others, or well-known sorts, should be stated. The Reporter is further requested to mention the effects that he may have observed produced by different soils, manures, &c., on the plants forming the subjects of reports, and how far he may have ascertained such effects to be lasting.

Should any improved variety reported upon be the result of direct experiment by cross impregnation, involving expense and long-continued attention, a higher premium will be awarded.

Reports to be lodged by 1st November 1865.

13. COMPARATIVE PRODUCTIVENESS, &c., OF POTATOES.

For an approved Report on the comparative productiveness and general qualities for use and keeping, of the different kinds of Potatoes used in field culture—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1866.

14. COMPARATIVE PRODUCTIVENESS, &c., OF TURNIPS.

For an approved Report of the comparative productiveness and general qualities for use and keeping of the different kinds of Swedish, Yellow, and White Turnips, generally used in field culture—The Medium Gold Medal, or Five Sovereigns.

Reports to be lodged by 1st May 1866.

15. CABBAGE.

For an approved Report on the cultivation of the Cabbage as a field crop—The Medium Gold Medal, or Five Sovereigns.

The experiment must be conducted on not less than one acre, and contrasted with a like extent under turnips in the same field. Both lots must have been under one rotation, and must be prepared and manured in the same manner.

Reports to be lodged by 1st May 1866.

16. VEGETABLE PRODUCTIONS OF INDIA, CHINA, AMERICA, &c.

For an approved Report on the hardy and useful herbaceous plants, including Grains and Grasses of China, Japan, the Islands of the Eastern Archipelago, the Himalaya Country, the Falkland and South Sea Islands, California, the high north-western districts of America, or any other country where such climate exists as to induce the belief that the plants may be beneficially introduced into the cultivation of Scotland—The Gold Medal, or Ten Sovereigns.

Reporters are required to give the generic and specific names of the plants treated of, with the authority for the same—together with the native names, in so far as known; and to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is further requested that the descriptions be accompanied, in so far as possible, with specimens of the plants, and their fruit, seed, or other products.

Reports to be lodged by 1st November in any year.

FEEDING STOCK.

The experiments specified in Nos. 17, 18, and 19 must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten Sheep. The animals selected should be of the same age, sex, and breed, and, as nearly as possible, of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and, if killed, their dead weight and quantity of tallow.

17. BEST MODES OF HOUSING FATTENING CATTLE.

For an approved Report on the comparative advantages of fattening Cattle in stalls, in loose houses or boxes, and in sheds or hammels—Twenty Sovereigns.

The Report must detail the comparative result of actual experiments. The same quantities and kinds of food shall be used. Information is required as to the comparative expense of attendance, the cost of erecting the buildings, and any other circumstances deserving of attention. The state of the weather during the experiment in point of temperature and wetness must be particularly noted and reported.

Reports to be lodged by 1st May in any year.

18. DIFFERENT DESCRIPTIONS OF FOOD.

For an approved Report of experiments for ascertaining the actual addition of weight to growing or fattening stock, by the use of different kinds of food—Twenty Sovereigns.

The attention of the experimenter is directed to turnips, carrots, beet, mangold-wurzel, potatoes, cabbage, as well as to beans, oats, barley, Indian corn, linseed, oil-cake, or rape-cake, and to the effect of warmth and proper ventilation, and the difference between food cooked and raw. The above roots and other kinds of food are merely suggested; Competitors are neither restricted to them, nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substances in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared; this will form an interesting experiment of itself, for Reports of which encouragement will be given.

Reports to be lodged by 1st May in any year.

19. COMPARATIVE QUALITIES OF DIFFERENT FEEDING CAKES.

For an approved Report on the comparative feeding qualities of Linseed-Cake and other Cakes, to be ascertained by feeding two lots of Cattle on different varieties of these substances, with or without Turnips, or other ordinary food, equal quantities of the cakes being given. Information is desired in reference to the comparative qualities of home and foreign made Cakes—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1866.

20. DISEASES OF FARM HORSES.

For an approved Report on the nature, symptoms, causes, preventive and remedial treatment of the diseases to which Farm Horses are subject—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1865.

21. RURAL ECONOMY ABROAD.

For an approved Report, founded on personal observation, of any useful practice, in rural economy, adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal.

The purpose chiefly contemplated by the offer of this premium, is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland.

Reports to be lodged by 1st November in any year.

Section 2—WOODS AND PLANTATIONS.

1. EXTENSIVE PLANTING.

For an approved Report by a Proprietor who shall, within the five preceding years, have planted not less than 150 acres. The whole planting operations that may have been condcted by the Reporter within the five years, whether completed or not, must be embraced, and he must state the expense—description of soil—age, kind, and number of trees planted per acre—mode of planting, draining, and fencing—general state of the plantation—and any other observations of interest—The Gold Medal.

Reports to be lodged by 1st November in any year.

2. FORMATION AND MANAGEMENT OF YOUNG PLANTATIONS.

For an approved Report of Plantations formed within a period of not more than ten, nor less than five years preceding the date of the Report—The Gold Medal, or Ten Sovereigns.

The Report should comprehend every interesting particular; among others, the exposure, altitude, and general climate of the locality—the character and condition of the soil and subsoil—a detailed statement of the expense, including that of enclosing, draining, and fencing, and a specification of the manner in which these operations were performed—the mode of planting adopted—the prevailing weather while planting, and for a month after the operation—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks and deaths at the end of three years—the system of management—the state of the plantations at the date of making the Report—and any other observations of interest.

Reports to be lodged by 1st November in any year.

3. GENERAL MANAGEMENT OF PLANTATIONS.

For an approved Report of the management of Plantations, from the commencement of the first thinning till the period of yielding full-grown timber—The Gold Medal, or Ten Sovereigns.

The Report must embrace the following points:—the progress of the different sorts of trees—the effects of altitude and exposure—the general advantages of shelter—the mode of thinning and pruning adopted—the uses and value of the thinnings—the plan of registry and of valuing, or a specimen of the method in which the forester's book is kept—the valuation at the time of the Report—together with such general remarks as may be thought useful.

The Report is not expected to embrace the formation and early management, farther than the description of soil, kinds of plants, whether mixed or in masses, together with a note of the expense from the time of planting to the commencement of the first thinning, in so far as such information is in the possession of the Reporter.

Reports to be lodged by 1st November in any year.

4. PLANTING ON EXPOSED OR ON BARREN TRACTS.

For an approved Report on successful planting within the influence of the sea, or on exposed sterile tracts, founded on observation of the habits and appearance of the different sorts of trees considered best suited for such situations—The Gold Medal, or Ten Sovereigns.

The plantations reported on must not be less than ten years old.

Information is particularly desired regarding the species and varieties of trees calculated for growing in situations unfavourable to most of those generally cultivated, as bleak heaths, sandy links, unsheltered maritime situations, and high northern exposures.

The Reporter must specify the extent of planting and mode of drainage and fencing—the nature of the soil and subsoil—the elevation and exposure of the locality—its distance from the sea; and, if in his power, he should notice the geological features of the district.

Reports to be lodged by 1st November in any year.

5. CORSICAN FIR.

For an approved Report on the value, for economical purposes, of the Corsican Fir, and on its adaptation to different soils and situations—The Medium Gold Medal, or Five Sovereigns.

The Reporter's observations must go beyond the limited knowledge of this tree as hitherto grown in Britain, and must embrace its nature, uses, and adaptations in those countries of which it is a native.

Reports to be lodged by 1st November in any year.

6. AMERICAN AND CANADIAN TREES.

For an approved Report on the American and Canadian forest trees adapted for cultivation in Great Britain—The Medium Gold Medal, or Five Sovereigns.

The Reporter will enumerate and describe the varieties which have been, or which may be, usefully introduced from North America—the soils, situations, and conditions most suitable for them—their economic uses and qualities, and the success which may have attended the cultivation of any of them in Great Britain.

Reports to be lodged by 1st November 1865.

7. FOREST TREES OF RECENT INTRODUCTION.

For an approved Report on the more extended introduction of hardy, useful, or ornamental trees, which have not hitherto been generally cultivated in Scotland—The Medium Gold Medal, or Five Sovereigns.

The Report should specify as distinctly as possible the kind of trees introduced. The adaptation of the trees for use or ornament, and their comparative progress, should be mentioned. Attention is directed to the introduction of any tree as a nurse in young plantations, which, by growing rapidly for several years, and attaining maturity when at the height of 20 or 25 feet, might realise the advantages and avoid the evils of thick planting.

Reports to be lodged by 1st November in any year.

8. ROOTS OF CONIFERÆ.

For an approved Report of experiments on the uses to which the fibrous parts of the roots of Coniferous trees may be applied—The Medium Gold Medal, or Five Sovereigns.

In North-West America, the fibrous parts of the roots of some Coniferous trees are extensively employed for purposes similar to those to which willows are applied in this country, more particularly when the wood has been grown on soft, peaty soils. The object of the premium is to elicit information regarding the possibility of profitably extracting and economically applying the vast quantities of roots left in the ground.

Reports to be lodged by 1st November in any year.

9. TRANSPLANTING TREES.

For an approved Report on transplanting large trees and shrubs—The Medium Gold Medal, or Five Sovereigns.

The report must state the season and circumstances best suited for the various species; the most economical and efficient method; the precautionary measures to be observed subsequent to planting; and such practical results as are within the knowledge of the reporter. His attention should also be directed to the comparative advantages, in point of cost, progress, &c., of planting trees from 3 to 6 feet high, instead of the ordinary sizes, in cases where immediate effect, as well as permanent results, are desired.

Reports to be lodged by 1st November 1865.

SECTION 3.—LAND IMPROVEMENTS.

1. GENERAL IMPROVEMENT OF ESTATES.

To the Proprietor who shall report the most judicious, successful, and extensive improvement—The Gold Medal, or Ten Sovereigns.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the reporter's proprietorship.

Reports to be lodged by 1st May in any year.

2. RECLAMATION OF WASTE LAND BY TILLAGE.

1. For an approved Report by a Proprietor or Tenant of having reclaimed, within the six preceding years, not less than fifty acres of Waste Land—The Gold Medal, or Ten Sovereigns.

2. For an approved Report by a Tenant of having reclaimed within the four preceding years not less than twenty acres of Waste Land—The Medium Gold Medal, or Five Sovereigns.

3. For a similar Report by a Tenant of having reclaimed not less than ten acres—The Silver Medal.

The Reports may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of a profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return*, and a certified measurement of the ground, are requisite.

Reports to be lodged by 1st May in any year.

3. IMPROVEMENT OF NATURAL PASTURE WITHOUT TILLAGE.

1. For an approved Report of the improvement of the pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns.

2. For an approved Report of a similar improvement of not less than ten acres—The Silver Medal.

Reports must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

Reports to be lodged by 1st May in any year.

SECTION 4.—AGRICULTURAL MACHINERY.

INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

For approved Reports of such inventions or improvements, by the Reporters, of any Agricultural Implement or Machine as shall be deemed by the Society of public utility—Medals, or sums of money not exceeding Fifty Sovereigns.

Reports may be lodged with the Secretary at any time, and should be accompanied by drawings and descriptions of the implement or machine, and, if necessary, by a model.

CLASS II.

DISTRICT COMPETITIONS.

The Money Premiums awarded at District Competitions will be paid on 1st January next, by precepts issued by the Directors. No payments must therefore be made by the Secretary or Treasurer of any local Association.

(*Grants in aid of* DISTRICT COMPETITIONS *for* 1866 *must be applied for before* 1st NOVEMBER *next.*)

SECTION I. CATTLE.

1. *The County of Ayr.*
2. *The County of Renfrew.*
3. *The District of Strathbogie.*
4. *The County of Stirling.*
5. *The District of Strontian.*
6. *The County of Banff and District of Turriff.*
7. *The District of Formartine.*
8. *The District of the Perth, Fife, Kinross, and Clackmannan Association.*
9. *The Islands of Shetland.*
10. *The District of Annandale.*
11. *The District of Kintyre.*
12. *The Island of Skye.*
13. *The County of Elgin.*
14. *The County of Nairn.*

Conveners of Committees.

FIRST DISTRICT—Sir James Fergusson, Bart., M.P.
SECOND DISTRICT—Lieutenant-Colonel Mure of Caldwell.
THIRD DISTRICT—Robert Simpson of Cobairdy.
FOURTH DISTRICT—John Stirling of Kippendavie.

FIFTH DISTRICT—Sir Thomas Miles Riddell, Bart.
SIXTH DISTRICT—Alexander Morison of Bognie.
SEVENTH DISTRICT—John Ramsay of Barra.
EIGHTH DISTRICT—The Earl of Rosslyn.
NINTH DISTRICT—Robert Bell of Lunna.
TENTH DISTRICT—Sir William Jardine, Bart.
ELEVENTH DISTRICT—John Lorn Stewart of Coll.
TWELFTH DISTRICT—Alexander K. Mackinnon of Corry.
THIRTEENTH DISTRICT—Sir A. P. Gordon Cumming, Bart.
FOURTEENTH DISTRICT—W. A. Stables, Cawdor Castle.

PREMIUMS.

1. For the Best Bull, of any pure breed, not exceeding eight years old, belonging to a Proprietor—The Silver Medal.
2. For the best Bull, of any pure breed, calved before 1st January 1863, and not exceeding eight years old, £7
3. For the second best, ... £4
4. For the best Bull, of any pure breed, calved after 1st January 1863, ... £6
5. For the best two-year-old Heifer (if Highland breed, three years), of any pure breed, . . £5
6. For the second best, ... £3

Proprietors farming the whole of their own lands may compete for the Money Premiums.

Note.—The Society's Premiums are granted to each district for three alternate years, on condition that the district shall, in the two intermediate years, continue the Competitions by offering for the same description of stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, a Silver Medal will be placed at the disposal of the Committee to be awarded to the best lot exhibited.

In 1865,

Nos. 1, 2, 3, and 4, are in competition for the last year.
Nos. 5 and 6 for the second year.
Nos. 7 and 8 for the first year.

Nos. 9, 10, and 11, compete for local Premiums.
Nos. 12, 13, and 14, are in abeyance on account of the General Show at Inverness.

RULES OF COMPETITION.

1. The Members of the Society connected with the respective Districts are appointed Committees for arranging the Competitions; five members to be a quorum.

2. The Convener of each district shall summon a Meeting of Committee for the purpose of determining the time and place of Competition, the nomination of Judges,, and other preliminary arrangements. The time and place (which must be within the bounds of the district) shall be publicly intimated by Conveners.

3. The Competitions must take place between the 1st of April and the 10th of October, and are open to all parties within the district, whether Members of the local Association or not. The animals exhibited must belong to one of the following pure breeds:—Shorthorn—Ayrshire—Polled (Galloway, Angus, or Aberdeen)—Highland. The Bulls may be of one breed, and the Heifers of another. The Committee shall select the breed, and specify it in the returns.

4. Stock of an inferior description, or which does not fall within the prescribed regulations, shall not be placed for competition. The Premiums shall not be divided. *No money Premium shall be adjudged unless there are three lots exhibited, and not more than one-half unless there are six.* A competitor may exhibit two lots in each class. For the Medal, two lots are required.

5. An animal which has gained the Society's first Premium at a previous district or general Show is inadmissible in the same class, except for the Medal; and one which has gained a second money Premium can only thereafter compete in that class for the first.

6. A Tenant or Factor may compete with Proprietors for the Medal with a Bull which has gained the first money premium at a previous Show. When there is any doubt as to whether a Competitor should be ranked as a Proprietor or a Tenant, the point is left to the decision of the local Committee.

7. A Bull, the property of two or more Tenants, may compete, although the Exhibitors may not be joint-tenants. Bulls not belonging to the District may compete, provided they are left within it for service.

8. Stock must be the property of the Exhibitor at the date of entry, *and no entry shall be received later than one week previous to the Show.* Entry-money shall not exceed $2\frac{1}{2}$ per cent. on the amount of the premium to be competed for.

9. Bulls for which the money Premiums are awarded may be required to serve in the District at least one season; the rate of service to be fixed by the Committee.

10. Should it be proved to the satisfaction of the Committee that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Committee or Judges as to its qualifications or properties, the case shall be reported to the Directors, and submitted by them to the first General Meeting, in order that the Exhibitor shall be disqualified from again

competing at the Society's Shows, and his name, if he be a member, struck from the roll.

11. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Committee to judge of its validity.

12. Blank Reports will be furnished to the Conveners of the different districts. These must, in all details, be completed and lodged with the Secretary on or before the 1st of November next, for the approval of the Directors, against whose decisions there shall be no appeal.

13. A Report of the Competition and Premiums awarded at the *intermediate* local Shows, in the several Districts, signed by a Member of the Society must be transmitted to the Secretary on or before the 1st November in each year, otherwise the Society's grant shall terminate.

14. It is to be distinctly understood, that in no instance does any claim lie against the Society for expenses attending a Show of Stock, beyond the amount of the Premiums offered.

Section 2. DRAUGHT HORSES.

1. *The District of Wester Ross.*
2. *The District of the Perth, Fife, Kinross, and Clackmannan Association.*

Conveners of Committees.

First District—Keith W. Stewart Mackenzie of Seaforth.
Second District—Sir G. Graham Montgomery, Bart., M.P.

PREMIUMS.

1. For the best Stallion, for agricultural purposes, not under three years and nine months, and not above twelve years old, £25
2. For the best Brood Mare, for agricultural purposes, . 10
3. For the best Filly, foaled after 1st January 1863, . 5

These premiums are granted for two years, £30 being contributed by the Society, and £10 by the District.

In 1865,

No. 1 is in competition for the second year.
No. 2 for the first year.

RULES OF COMPETITION.

1. The Members of the Society in the several Districts are appointed Committees of Superintendence. They shall be convened in the manner and for the purposes prescribed by Nos. 1 and 2 of the Regulations for Cattle Competitions.

2. The competition for Stallions, and that for Mares and Fillies, may be held at different periods, but both must take place within the districts named, unless, in reference to Stallions, special permission has been obtained to the contrary.

3. If fewer than three animals be exhibited in any class, half the Premium only can be awarded. The Regulations for Cattle Shows, regarding intimation—entry of stock—its exclusion, if of inferior character—false entries—extra expenses—and the manner in which the Reports are to be certified and transmitted to the Society—are severally applicable to the Premiums for Horses. Evidence must be produced that the Prize Stallions have had produce. Mares must have foals at their feet, or be entered as being in foal; in the latter case payment of the Premium will be deferred till certificate of birth.

ENTIRE COLTS.

1. *The County of Lanark.*
2. *The County of Linlithgow.*
3. *The County of Edinburgh.*

Conveners of Committees.

FIRST DISTRICT—J. G. C. Hamilton of Dalzell.
SECOND DISTRICT—R. H. Johnston Stewart of Straiton.
THIRD DISTRICT—Sir James Gardiner Baird, Bart.

PREMIUMS.

1. For the best Entire Colt, for agricultural purposes, foaled after 1st January 1863, ... £6
2. For the best Entire Colt, for agricultural purposes, foaled after 1st January 1864, ... £4

Four lots in each Class will warrant the award of full, and two lots of half, premiums. The other regulations for Horses are generally applicable. These premiums are granted for two years.

In 1865,

Nos. 1, 2, and 3 are in competition for the first year.

Section 3. SHEEP.

The Premiums for sheep are granted for three alternate years, under the same conditions as those for Cattle. See Note, p. 25.

A Silver Medal, as in the case of Cattle, is allowed for the intermediate years.

1. LEICESTER BREED.

1. *The Stewartry of Kirkcudbright.*
2. *The County of Forfar.*
3. *The District of the Border Union Society.*

Conveners of Committees.

First District—Wellwood H. Maxwell of Munches.
Second District—Sir John Ogilvy, Bart., M.P.
Third District—Sir George H. Scott Douglas, Bart.

1. For the best Tup, belonging to a Proprietor—The Silver Medal.
2. For the best Tup of any age, . . . £5
3. For the best Shearling Tup, . . . £5
4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best Pen of five Gimmers or Shearling Ewes, £4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1865,

No. 1 is in competition for the first year.
Nos. 2 and 3 compete for local Premiums.

2. CHEVIOT BREED.

1. *The District of Mull, Coll, and Tyree.*
2. *The District of West Teviotdale.*
3. *The County of Peebles.*
4. *The Pastoral District of Ross-shire.*
5. *The County of Sutherland.*

Conveners of Committees.

First District—Farquhar Campbell of Aros.
Second District—Allan Eliott Lockhart of Borthwickbrae.
Third District—Sir Graham G. Montgomery, Bart.
Fourth District—Sir Kenneth S. Mackenzie of Gairloch, Bart.
Fifth District—George Dempster of Skibo.

1. For the best Tup belonging to a Proprietor—The Silver Medal.
2. For the best Tup of any age, . . . £5
3. For the best Shearling Tup, . . . £5
4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best Pen of five Gimmers or Shearling Ewes, £4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1865,

No. 1 is in competition for the first year.
Nos. 2 and 3 compete for local Premiums.
Nos. 4 and 5 are in abeyance, on account of the General Show at Inverness.

3. BLACKFACED BREED.

DISTRICTS.

1. *The Upper Ward of Lanarkshire.*
2. *The District of Argyll.*
3. *The District of Athole and Weem.*
4. *The District of Lorn.*
5. *The District of Lochaber.*

Conveners of Committees.

First District—John Ord Mackenzie of Dolphinton.
Second District—William Campbell of Ormsary.
Third District—Sir Robert Menzies of Menzies, Bart.
Fourth District—Sir John Macdougall of Macdougall, K.C.B.
Fifth District—Donald Cameron of Lochiel.

1. For the best Tup belonging to a Proprietor—The Silver Medal.
2. For the best Tup of any age, . . . £5
3. For the best Shearling Tup, . . . £5

4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best Pen of five Gimmers or Shearling Ewes, £4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1865,

Nos. 1 and 2 are in competition for the last year.
No. 3 for the first year.
No. 4 competes for local Premiums.
No. 5 is in abeyance, on account of the General Show at Inverness.

RULES OF COMPETITION.

1. The Members of the Society in the several Districts are appointed Committees as under Nos. 1 and 2 of the Regulations for Cattle Competitions, and they shall be convened by their respective Conveners in the manner and for the purposes specified in these regulations.

2. The Competition is open to all within the district; it shall take place between the 1st of April and the 10th of October, and the time and place must be publicly intimated by each Convener within his District.

3. Tups shall have served the usual number of Ewes for at least three weeks during the previous season. All prize Tups must serve within the District. The Competitions are open to Tups not belonging to the District, provided they are left for service. Ewes must have reared Lambs during the season. Ewes and Gimmers must be taken from regular breeding hirsels.

4. The Premiums shall not be divided. *No money Premiums shall be adjudged unless there are three lots exhibited, and only one-half if there are not six lots.* Each Competitor may show two lots. For the Medal two lots are required. The other Regulations for Cattle Competitions,—in regard to the date of Entry—the amount of Entry-Money—the placing of Stock—the exclusion of Animals which have gained premiums at previous Shows—the right of a Tenant or Factor, under certain circumstances, to compete for the Medal—reporting false entries—the Regulation as to expenses—the manner in which the Reports must be certified and transmitted—and the incompetency of appeal against decisions by the Directors,—are applicable to the Premiums for Sheep.

5. Blank reports will be furnished to the Conveners of Districts. These must be accurately filled up in all details, signed by the Convener, and transmitted to the Secretary by the 1st of November. Reports of intermediate Competitions must be lodged at the same time.

4. SHEARING SHEEP.

The Silver Medal will be given to the best Sheep-shearer in each of the Districts in which the Premiums for Sheep are in operation.

CONDITIONS.

1. Money Premiums must be awarded by the District at each Competition to the amount of not less than £2.

2. The District Convener will fix the time and place of Competition, and make all necessary arrangements.

3. The Medal shall not be awarded unless there are three competitors, and it shall always accompany the highest Money Premium. If two or more lots appear to be equally well executed, preference should be given to that executed within the shortest time.

4. The Conveners shall report the particulars of the Competition and the award of the Judges to the Society, along with the Report of the Sheep Premiums in the District.

SECTION 4. SWINE.

DISTRICTS.

1. *The District of Alford.*
2. *The District of Dalkeith.*

Conveners of Committees.

FIRST DISTRICT—Robert O. Farquharson of Haughton.
SECOND DISTRICT—Sir James Gardiner Baird, Bart.

1. For the best Boar belonging to a Proprietor—The Silver Medal.
2. For the best Boar, ... £4
3. For the second best, ... £2
4. For the best Breeding Sow, . . . £3
5. For the second best, ... £1

Proprietors farming the whole of their own lands may compete for the Money Premiums.

The above Premiums are given to each District for three consecutive years.

In 1865,

No. 1 is in competition for the last year.
No. 2 for the second year.

1. The Regulations for Cattle Competitions are generally to be held as applicable to the Premiums for Swine; and the Convener and Committee of the Society's Members in the District are accordingly referred to them.

2. Four lots in each class will warrant the award of full, and two lots of half premiums. There must be at least two Competitors for the medal.

3. Blank Reports will be furnished to the Conveners of Districts. These must be accurately filled up in all details, signed by the Convener, and transmitted to the Secretary by the 1st of November next.

CLASS III.

DAIRY PRODUCE.

DISTRICTS.

1. *The County of Lanark.*
2. *The Western District of Mid-Lothian.*
3. *The Lower Ward of Renfrewshire.*

Conveners of Committees.

First District—J. G. C. Hamilton of Dalzell.
Second District—Peter M'Lagan of Pumpherston.
Third District—Sir M. R. Shaw Stewart, Bart., M.P.

1. BUTTER.

1. For the best sample of Cured Butter (not less than 14 lbs.) belonging to a Proprietor—The Silver Medal.
2. For the best sample of Cured Butter (not less than 14 lbs.) £3
3. For the second best, ... £2

2. CHEESE.

4. For the best couple of Sweet-Milk Cheeses belonging to a Proprietor—The Silver Medal.
5. For the best couple of Sweet-Milk Cheeses, . . . £3
6. For the second best, ... £2

Proprietors farming the whole of their own lands may compete for the Money Premiums.

The above Premiums are given to each District for three consecutive years.

In 1865,

No 1 is in competition for the last year.
Nos. 2 and 3 for the second year.

CONDITIONS.

1. The Members of the Society, resident within the Districts, are appointed Committees of Superintendence, for the purposes expressed in the Regulations for Cattle Competitions. Each Committee shall fix such general regulations as they may consider proper—and, in particular, the time and place of competition.

2. Eight lots in any one Class will warrant an award of full, and four lots of half Premiums. There must be at least two Competitors for the Medal.

3. Competitors must certify that the Butter and Cheese exhibited by them are average specimens of the produce of their Dairies in 1865; and that the quantity produced during the season has not been less than 1 cwt. of Butter, or 2 cwt. of Cheese.

4. In the event of two or more competing lots being deemed equal in quality, the Premium shall be awarded to the Competitor who has made the larger quantity.

5. The successful Competitors, before receiving the Premiums, are required to transmit to the Secretary a detailed Report of the whole process followed by them in the manufacture of their Butter or Cheese.

6. Reports of the award of the Premiums to be lodged with the Secretary on or before the 1st November next.

MEDALS FOR CHEESE.

Two Medium Gold Medals will be placed at the disposal of the Ayrshire Association to be competed for at Kilmarnock. The one, for the best lot of Cheddar Cheese—the other, for the best lot of Sweet-Milk Cheese of any other variety; the cheeses, in either case, to be made in Scotland—Convener of Committee, Colonel Ferrier Hamilton of Cairnhill.

CLASS IV.

CROPS AND CULTURE.

1. SEEDS.

The Society, with a view of aiding local Associations, gives the Silver Medal in the following districts, and for the following Seeds :—

1. County of Ayr: Convener, Sir James Fergusson, Bart., M.P.

    1. Any variety of Wheat.
    2. Any variety of Barley.
    3. Any variety of Oats.
    4. Perennial Rye Grass.

2. County of Stirling: Convener, John Stirling of Kippendavie.

    1. Any variety of Wheat.
    2. Any variety of Barley.
    3. Any variety of Oats.
    4. Any variety of Beans.
    5. Tares.

3. District of Wester Ross: Convener, Keith W. Stewart Mackenzie of Seaforth.

    1. Any variety of Wheat.
    2. Any variety of Barley.
    3. Any variety of Oats.
    4. Perennial Rye Grass.

4. District of The Black Isle: Convener, Major Wardlaw, Belmaduthy.

    1. Any variety of Barley.
    2. Any variety of Oats.

5. County of CAITHNESS: Convener, Alexander Henderson of Stemster.

1. Any variety of Barley.
2. Any variety of Oats.

6. Islands of SHETLAND: Convener, Robert Bell of Lunna.

1. Any variety of Bere.
2. Any variety of Oats.
3. Perennial Rye Grass.

7. District of SPEY, AVON, and FIDDOCHSIDE: Convener, Sir George Macpherson Grant, Bart.

1. Any variety of Barley.
2. Any variety of Oats.

8. District of STRATHEARN: Convener, Sir John Stuart Forbes, Bart.

1. Any variety of Oats..

CONDITIONS.

1. In each District the Convener shall fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements, in concurrence with the other Members of the Society, and the local Association of the District. Conveners will be furnished with blank Schedules for reporting the awards.

2. The quantity shown in Competition by each Grower must not be less than three quarters of each variety of Grain, or two quarters of Beans or Grass Seeds. There must at least be two Competitors. The first Premium awarded by the District shall not be less than £1 for each kind of grain for which a Medal is claimed.

3. The Judges shall be guided in their awards—1*st*, By the Purity of the Seed; 2*d*, By its freeness from Extraneous Seeds; and, 3*d*, Where there is an equality in these respects by the Weight.

4. Successful Competitors must transmit, free of expense, two quarts of each kind of seed, addressed to the Secretary at the Society's Museum, George IV. Bridge, Edinburgh.

5. The Returns must shew, as accurately as possible, the produce per imperial acre, also the altitude, exposure, and nature of the soil on which the crops were raised, together with the dates of sowing and reaping, and the weight per bushel. The varieties for which Premiums have been given must be named. Reports of the several Competitions must be lodged by the 1st of November.

6. The Medals will be continued in each District for five consecutive years. Applications from other Districts must be lodged with the Secretary of the Society by 1st November next.

2. PLOUGHING COMPETITIONS.

The Silver Medal will be given to the winner of the first Premium at Ploughing Competitions, where there are fifteen Ploughs, and Premiums to the amount of Three Sovereigns, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society, and the undernoted conditions have been observed:—

FORM OF REPORT.

I   of   Member of the Highland and Agricultural Society, hereby certify, that I attended the Ploughing Match of the   Association at   in the county of   on the   when   ploughs competed;   of land was assigned to each, and   hours were allowed for the execution of the work.. The sum of £   was awarded in the following proportions, viz.:—

[Here enumerate the names and designations of successful Competitors.]

CONDITIONS.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.
2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, No. 6 Albyn Place, Edinburgh.
3. Not more than one Match, in the same season, can take place within the bounds of the same Society or Association.
4. All Reports must be lodged within one month of the date of the Match, and certified by a Member of the Society who was present at it.
5. A Member can only report one Match, and a Ploughman can only carry one Medal, in the same season.
6. To warrant the Medal there must have been fifteen Ploughs in Competition, and three Pounds awarded in Premiums.
7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others; on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the sufficiency of the work below, as well as to its neatness above the surface.

3. REAPING MACHINES.

The Silver Medal will be given to the Servant found most expert at a trial of Reaping Machines, when not fewer than four were in operation, and Premiums to the amount of Two Sovereigns were awarded. Reports must be lodged with the Secretary not later than the 1st of November, by a Member who has inspected the work.

4. MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society being anxious to co-operate with local Associations will give a limited number of Silver Medals annually, in addition to the Money Premiums awarded in the district:—

1. STOCK.—To Local Societies not on the list of District Competitions, awarding Premiums for Stock to the amount of £10, and reporting their Shows to the Secretary—The Silver Medal for the best Male and for the best Female animal of any Pure Breed.

Applied for by the Western District of Mid-Lothian Association—Convener, Peter M'Lagan of Pumpherston.
Penicuik Society—Convener, the Right Hon. Sir George Clerk, Bart.
Buchan Society—Convener, George Baird of Strichen.
Wester Ross Club—Convener, Keith W. Stewart Mackenzie of Seaforth.
Spey, Avon, and Fiddochside Association—Convener, Sir George Macpherson Grant, Bart.
Kilmarnock Club—Convener, Frederick J. Turner, The Dean.
Avondale Society—Convener, David Souter Robertson of Whitehill.
Dalbeattie Society—Convener, Wellwood H. Maxwell of Munches.
Black Isle Society—Convener, Major Wardlaw, Belmaduthy.
Fettercairn Club—Convener, Lieutenant-Colonel MacInroy of the Burn.
Mauchline Society—Convener, C. V. H. Campbell of Netherplace.
Cumnock Society—Convener, C. V. H. Campbell of Netherplace.

Sanquhar Society—Convener, James Veitch of Eliock.
Leochel-Cushnie Society—Convener, Arthur Forbes Gordon of Rayne.
Caithness Society—Convener, Alexander Henderson of Stemster.
Bute Society—Convener, James Muir, Barone Park.
Stewarton Society—Convener,
Galston Association—Convener, Alex. D. Tait of Milrig.
Cluny Association—Convener, John Gordon of Cluny.

2. WOOL.—For the best sample of the following wools:—

Laid Cheviot, washed.
Laid Cross, washed.
Laid Blackfaced, unwashed.
Hog, White Cheviot.
White Long.

The Silver Medal for each variety.

Applied for by the Inverness Farmers' Club, and subject to its conditions—Convener, Henry W. White of Monar.

3. For the best managed FARM—The Silver Medal.

Applied for by the Nairnshire Society—Convener, Wm. Alexander Stables, Cawdor Castle.
Inverness Society—Convener, Arthur Forbes of Culloden.
Kincardineshire Club—Convener, Sir John S. Forbes, Bart.
Mauchline Society—Convener, C. V. H. Campbell of Netherplace.
Kilmarnock Club—Convener, Frederick J. Turner, The Dean.
Cluny Association—Convener, John Gordon of Cluny.
Spey, Avon, and Fiddochside Society—Convener, Sir George Macpherson Grant, Bart.

4. For the best managed DAIRY—The Silver Medal.

Applied for by the Mauchline Society—Convener, Colonel Ferrier Hamilton.
Kilmarnock Club—Convener, Frederick J. Turner, The Dean.

5. For the best managed GREEN CROP—The Silver Medal.

Applied for by the Bute Society—Convener, James Muir, Barone Park.
Inverness Society—Convener, Arthur Forbes of Culloden.

Leochel-Cushnie Society—Convener, A. Forbes Gordon of Rayne.
Clackmannan Society—Convener, James Johnstone of Alva.
Fettercairn Club—Convener, Lieut.-Colonel MacInroy of the Burn.
Mauchline Society—Convener, C. V. H. Campbell of Netherplace.
Kincardineshire Club—Convener, Sir John S. Forbes, Bart.
Kilmarnock Club—Convener, Frederick J. Turner, The Dean.
Cluny Association—Convener, John Gordon of Cluny.

6. For the best managed Hay Crop—The Silver Medal.

Applied for by the Clackmannanshire Society—Convener, James Johnstone of Alva.

7. For the best kept Fences—The Silver Medal.

Applied for by the Kilmarnock Club—Convener, Frederick J. Turner, The Dean.

8. To the most expert Hedge-cutter—The Silver Medal.

Applied for by the Kilmarnock Club—Convener, Frederick J. Turner, The Dean.

9. To the Labourer most expert and efficient in opening, laying, and filling Drains, and otherwise executing the works necessary in thorough Draining—The Silver Medal.

Applied for by the Kilmarnock Club—Convener, Frederick J. Turner, The Dean.

10. For the best Sweet Milk Cheese—The Silver Medal.

Applied for by the Cumnock Society—Convener, C. V. H. Campbell of Netherplace.
Sanquhar Society—Convener, James Veitch of Eliock.
Stewarton Society.
Shetland Society—Convener, Robert Bell of Lunna.

11. For the best Cured Butter—The Silver Medal.

Applied for by the Cumnock Society—Convener, C. V. H. Campbell of Netherplace.
Sanquhar Society—Convener, James Veitch of Eliock.
Shetland Society—Convener, Robert Bell of Lunna.

12. For the best Collection of Roots—The Silver Medal.

Applied for by the Cumnock Society—Convener, C. V. H. Campbell of Netherplace.
Sanquhar Society—Convener, James Veitch of Eliock.

13. For the best Collection of Seeds—The Silver Medal.

Applied for by the Cumnock Society—Convener, C. V. H. Campbell of Netherplace.
Sanquhar Society—Convener, James Veitch of Eliock.
Stewarton Society—Convener,

The Medals to be issued will be limited to ten in each class, except No. 1.

The Money Premiums given in the District must be £2 in each case, and in No. 1, £10.

Reports of the several Competitions, and applications for Medals in 1866, must be lodged by 1st November next.

CLASS V.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned. The Medals and one-half of the Premiums are given by the Society, and the other half is contributed by the respective Parishes.

COTTAGES.

1. For the best kept Cottage in each Parish—One Pound Five Shillings; and where there are four Competitors—The Silver Medal.
2. For the second best—One Pound.
3. For the third best—Fifteen Shillings.

GARDENS.

1. For the best kept Cottage Garden in each Parish—One Pound Five Shillings; and where there are four Competitors—The Silver Medal.
2. For the second best—One Pound.
3. For the third Best—Fifteen Shillings.

Aberdeenshire.

LEOCHEL-CUSHNIE—Convener, Arthur Forbes Gordon of Rayne.
STRICHEN—Convener, George Baird of Strichen.
BIRSE—Convener, James Dyce Nicol of Ballogie.

Edinburghshire.

WEST-CALDER—Convener, Robert Steuart of Carfin.

Lanarkshire.

LESMAHAGOW—Convener, W. E. Hope Vere of Blackwood.
DOUGLAS—Convener, Thomas Rennie Scott, Castle Mains.

Peeblesshire.

BROUGHTON—Convener, James Tweedie of Quarter.

Perthshire.

FORGANDENNY—Convener, Rev. John Pagan.

Wigtownshire.

KIRKCOLM—Convener, David Guthrie, Stranraer.
LESWALT—Convener, Sir Andrew Agnew of Lochnaw, Bart., M.P.
PORT-PATRICK—Convener, Sir Edward Hunter Blair, Bart.
OLD LUCE—Convener, Sir John C. Dalrymple Hay of Park Place, Bart.
STONEYKIRK—Convener, David Frederick, Dumbreddon.

CONDITIONS.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Gentlemen's Lodges and Gardeners' Houses, as well as Gentlemen's Servants occupying Cottages in the Policies, or on land in the natural possession of their masters, are excluded. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, shall not exceed £5 sterling. A person who has gained the highest Premium cannot compete again, but will be entitled to a Medal if certified by the Committee to be equal in merit to the first on the list of Competitors.

4. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly—the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

5. In estimating the claims for the Garden Premiums, the Judges should have in view—the sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

6. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary on or before 1st November next.

Parishes desirous of these Premiums must lodge applications with the Secretary on or before the 1st November next.

MEDALS FOR COTTAGES OR GARDENS.

The Society will issue annually twelve Medals to local Associations or individuals, who at their own expense establish Premiums for Cottages or Gardens.

The Medals will be issued upon a Report by a Member of the Society in the terms required by the preceding conditions, describing the merits of the Cottages or Gardens. The Reports to be lodged with the Secretary on or before the 15th October 1865.

Applied for by

The Parishes of Forglen and Alvah.
The Mauchline Horticultural Society.
The Newburgh Gardening Society.
The Conan and Maryburgh Gardening Society.
The United East Lothian Society.
The Logiealmond and Glenalmond Horticultural Society.
Arthur Forbes Gordon of Rayne.
Archdeacon Bisset of Lessendrum.
Sir George Macpherson Grant, Bart.

IMPROVING EXISTING COTTAGES.

To the Proprietor in Scotland who shall report the Improvement of the greatest number of Cottages in the years 1862, 1863, and 1864—The Gold Medal.

BUILDING NEW COTTAGES.

To the Proprietor in Scotland who shall report the Erection of the greatest number of approved Cottages during the years 1861, 1862, 1863, and 1864—The Gold Medal.

CONDITIONS.

1. Claims for the above Premiums must be lodged with the Secretary on or before the 1st of October next, to allow an inspection to be made of the different Cottages. The inspection will be conducted by a Committee of the Society's Members, and Reports must be transmitted to the Secretary on or before the 1st November.

2. The annual value of the Cottage or Cottages separately, with the garden ground, must not exceed £5.

3. In estimating the claims of Competitors, the following points will be kept in view:—The external appearance of the Cottages; their internal accommodation; the arrangements of the outhouses; the means of drainage and ventilation; and the expense of the building or of the alteration, compared with its durability and accommodation. When the Cottages of one Competitor are superior in style and comfort to those of another, though not so numerous, the Inspectors will give them the preference, provided they amount at least to three, and have been erected at a moderate expense.

4. Parties competing will forward to the Society Plans, Specifications, and Estimates, of which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

ACCOMMODATION FOR FARM-SERVANTS.

To the Proprietor in Scotland who shall have erected on his estate the most approved Farm-buildings in reference to the proper accommodation of Farm-servants—The Gold Medal.

Reports, Plans, and Specifications to be lodged by the 1st November 1865.

GENERAL SHOW OF STOCK AND IMPLEMENTS,

AT

INVERNESS,

ON 31ST JULY, AND 1ST, 2D, AND 3D AUGUST 1865.

HIS GRACE THE DUKE OF ARGYLL, K.T.,
President of the Society.

THE RIGHT HONOURABLE LORD LOVAT,
Chairman of the Local Committee.

The District connected with the Show comprises the Counties of INVERNESS, ELGIN, ROSS and CROMARTY, CAITHNESS, SUTHERLAND, and NAIRN.

GENERAL ARRANGEMENTS.

STOCK

To be entered with the Secretary on or before Friday, 16th June.
Received in the Yard on Saturday and Monday, 29th and 31st July, and till 8 A.M. on Tuesday, 1st August.
Judged at 9 A.M. on Tuesday.
Exhibited Tuesday, Wednesday, and Thursday.

IMPLEMENTS

To be entered with the Secretary on or before Friday, 16th June.
Received in the Yard on Thursday, 27th, and till the Evening of Monday, 31st July.
Exhibited Tuesday, Wednesday, and Thursday.

TERMINATION OF SHOW.

Thursday, 3d August, at 5 P.M. Stock and Implements may remain in the Yard till Friday afternoon.

The Competition is open to Exhibitors from all parts of the United Kingdom.

Members of the Society are exempted from entry-money of 2½ per cent. on premiums for Stock. They are admitted to the Show-Yard at half price during the judging of Stock. At other periods they have free access.

New Members may be proposed for Election at the General Meeting on 28th June.

PREMIUMS.

NOTE.—*The Medium Gold Medal will be given to any Animal which, having gained the Society's highest Premium at a former Show in the classes of aged Bulls, Cows, Stallions, or Mares, is disqualified from again competing.*

CLASS I.—CATTLE.

SHORT-HORN.

Section		
1	Best Bull calved before 1st Jan. 1863,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
	Breeder of best Bull,	The Silver Medal.
2	Best Bull calved after 1st Jan. 1863,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
3	Best Bull calved after 1st Jan. 1864,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
4	Best Cow of any age,	Fifteen Sovereigns.
	Second best,	Eight Sovereigns.
	Third best,	The Bronze Medal.
5	Best Heifer calved after 1st Jan. 1863,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
6	Best Heifer calved after 1st Jan. 1864,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.

HIGHLAND.

7	Best Bull calved before 1st Jan. 1862,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
	Breeder of best Bull,	The Silver Medal.
8	Best Bull calved after 1st Jan. 1862,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
9	Best Bull calved after 1st Jan. 1863,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
10	Best Cow of any age,	Fifteen Sovereigns.
	Second best,	Eight Sovereigns.
	Third best,	The Bronze Medal.
11	Best Heifer calved after 1st Jan. 1862,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
12	Best Heifer calved after 1st Jan. 1863,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.

POLLED (ANGUS, ABERDEEN, AND GALLOWAY).

Section		
13	Best Bull calved before 1st Jan. 1863,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
	Breeder of best Bull,	The Silver Medal.
14	Best Bull calved after 1st Jan. 1863,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
15	Best Bull calved after 1st Jan. 1864,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
16	Best Cow of any age,	Fifteen Sovereigns.
	Second best,	Eight Sovereigns.
	Third best,	The Bronze Medal.
17	Best Heifer calved after 1st Jan. 1863,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
18	Best Heifer calved after 1st Jan. 1864,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.

Note.—When the number of Galloways exceeds Three in any Section, they will be judged separately from Polled Angus and Aberdeen, and distinct Premiums will be awarded.

AYRSHIRE.

19	Best Bull calved after 1st Jan. 1862,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
	Breeder of best Bull,	The Silver Medal.
20	Best Cow in Milk of any age,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
21	Best Cow in Calf of any age,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
22	Best Heifer calved after 1st Jan. 1863,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.

FAT STOCK.

23	Best Ox, of any Pure or Cross Breed calved after 1st Jan. 1862,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.

Section		
24	Best Ox, of any Pure or Cross Breed, calved after 1st Jan. 1863, . . .	Six Sovereigns.
	Second best, ...	Three Sovereigns.
	Third best, ...	The Bronze Medal.
25	Best Ditto, after 1st Jan. 1864 . . .	Four Sovereigns.
	Second best, ...	Two Sovereigns.
	Third best	The Bronze Medal.
26	Best Highland Ox calved after 1st Jan. 1861, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
27	Best Ditto, after 1st Jan. 1862, . .	Six Sovereigns.
	Second best, ...	Three Sovereigns.
	Third best, ...	The Bronze Medal.
28	Best Cross Heifer calved after 1st Jan. 1863, ...	Six Sovereigns.
	Second best, ...	Three Sovereigns.
	Third best, ...	The Bronze Medal.
29	Best Ditto, after 1st Jan. 1864, . . .	Four Sovereigns.
	Second best, ...	Two Sovereigns.
	Third best, ...	The Bronze Medal.

CLASS II.—HORSES

FOR AGRICULTURAL PURPOSES.

1	Best Stallion foaled before 1st Jan. 1862, ...	Thirty Sovereigns.
	Second best, ...	Fifteen Sovereigns.
	Third best, ...	The Bronze Medal.
	Breeder of best Stallion, ...	The Silver Medal.
2	Best Entire Colt foaled after 1st Jan. 1862, ...	Twenty Sovereigns.
	Second best, ...	Ten Sovereigns.
	Third best, ...	The Bronze Medal.
3	Best Entire Colt foaled after 1st Jan. 1863, ...	Fifteen Sovereigns.
	Second best, ...	Eight Sovereigns.
	Third best, ...	The Bronze Medal.
4	Best Entire Colt foaled after 1st Jan. 1864, ...	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.

Section		
5	Best Mare (with Foal at foot) foaled before 1st Jan. 1862,	Twenty Sovereigns.
	Second best,	Ten Sovereigns.
	Third best,	The Bronze Medal.
6	Best Mare (in Foal) foaled before 1st Jan. 1862,	Fifteen Sovereigns.
	Second best,	Eight Sovereigns.
	Third best,	The Bronze Medal.
7	Best Filly foaled after 1st Jan. 1862,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
8	Best Filly foaled after 1st Jan. 1863,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.
9	Best Filly foaled after 1st Jan. 1864,	Six Sovereigns.
	Second best,	Three Sovereigns.
	Third best,	The Bronze Medal.

PONIES.

10	Best Pony Stallion not exceeding 14 hands,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
11	Best Pony Mare not exceeding 14 hands,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.

CLASS III.—SHEEP.

LEICESTER.

1	Best Tup not above four shear,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
2	Best Dinmont or Shearling Tup,	Ten Sovereigns.
	Second best,	Five Sovereigns.
	Third best,	The Bronze Medal.
3	Best Five Ewes not above four shear,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.
4	Best Five Shearling Ewes or Gimmers,	Eight Sovereigns.
	Second best,	Four Sovereigns.
	Third best,	The Bronze Medal.

CHEVIOT.

Section		
5	Best Tup not above four shear, . . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
6	Best Dinmont or Shearling Tup, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
7	Best Five Ewes not above four shear,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
	Best Pen of Lambs shown with Ewes,	The Silver Medal.
8	Best Five Shearling Ewes or Gimmers,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

BLACKFACED.

9	Best Tup not above four shear, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
10	Best Dinmont or Shearling Tup, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
11	Best Five Ewes not above four shear, .	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
	Best Pen of Lambs shown with Ewes,	The Silver Medal.
12	Best Five Shearling Ewes or Gimmers,	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

SOUTHDOWN.

13	Best Tup not above four shear, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
14	Best Five Ewes not above four shear, or Gimmers, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

LONG-WOOLLED OTHER THAN LEICESTER.

15.	Best Tup not above four shear, . .	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.

Section		
16	Best Five Ewes not above four shear, or Gimmers, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

17	Best Tup not above four shear, ...	Ten Sovereigns.
	Second best, ...	Five Sovereigns.
	Third best, ...	The Bronze Medal.
18	Best Five Ewes not above four shear, or Gimmers, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.

EXTRA.

19	Best Five Shearling Wethers of any cross, ...	Six Sovereigns.
	Second best, ...	Three Sovereigns.
	Third best, ...	The Bronze Medal.
20	Best Five Lambs of any cross, ...	Four Sovereigns.
	Second best, ...	Two Sovereigns.
	Third best, ...	The Bronze Medal.

CLASS IV.—SWINE.

1	Best Boar, large breed, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
2	Best Boar, small breed, ...	Eight Sovereigns.
	Second best, ...	Four Sovereigns.
	Third best, ...	The Bronze Medal.
3	Best Sow, large breed, ...	Six Sovereigns.
	Second best, ...	Three Sovereigns.
	Third best, ...	The Bronze Medal.
4	Best Sow, small breed, ...	Six Sovereigns.
	Second best, ...	Three Sovereigns.
	Third best, ...	The Bronze Medal.
5	Best Pen of Three Pigs, not exceeding 8 months old, large breed, ...	Four Sovereigns.
	Second best, ...	Two Sovereigns.
	Third best, ...	The Bronze Medal.

Section		
6	Best Pen of three Pigs, not exceeding 8 months old, small breed, ...	Four Sovereigns.
	Second best, ...	Two Sovereigns.
	Third best, ...	The Bronze Medal.

EXTRA STOCK.

Animals not included in the Sections for Competition may be exhibited as Extra Stock, and will receive Honorary Premiums when specially commended.

SHEPHERDS' DOGS.

1	Best Dog, not exceeding 6 years old,	Two Sovereigns.
	Second best, ...	One Sovereign.
2	Best Bitch, not exceeding 6 years old,	Two Sovereigns.
	Second best, ...	One Sovereign.

CLASS V.—POULTRY.

Coloured Dorking.

Section		
1	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
2	Best Cockerel and 2 Pullets, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

White Dorking.

3	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
4	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

Coloured Cochin-China.

5	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
6	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

White Cochin-China.

7	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
8	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

BRAMAHPOOTRA.

Section		
9	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
10	Best Cockerel and 2 Pullets, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

MALAY.

11	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
12	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

SPANISH.

13	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
14	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

GOLDEN HAMBURG.

15	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
16	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

SILVER HAMBURG.

17	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
18	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

POLISH.

19	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
20	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

GAME.

21	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
22	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

Any other Breed.

Section		
23	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
24	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

Bantams.

25	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.
26	Best Cockerel and 2 Pullets, . . .	The Silver Medal.
	Second best, ...	The Bronze Medal.

Capons—*Of any Breed.*

27	Best 3 Capons, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

Ducks—*White Aylesbury.*

28	Best Drake and 2 Ducks, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

Ducks—*Rouen.*

29	Best Drake and 2 Ducks, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

Ducks—*Any other Breed.*

30	Best Drake and 2 Ducks, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

Turkeys—*Black Norfolk.*

31	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

Turkeys—*Any other Breed.*

32	Best Cock and 2 Hens, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

Geese.

33	Best Gander and 2 Geese, ...	The Silver Medal.
	Second best, ...	The Bronze Medal.

CLASS VI.—IMPLEMENTS.

Note.—Premiums for Implements and Machinery have been withdrawn, and trials, during the currency of a Show, discontinued, in terms of a report approved of by a General Meeting of the Society on 21st January 1863. Reference is made to General Regulations 33, 34, and 35, for the terms on which Implements may now be exhibited, and the conditions under which they will be tried and rewarded.

REGULATIONS.

GENERAL CONDITIONS.

1. Members of the Society are admitted to the Show-Yard without payment, on exhibiting a "*Member's Ticket,*" except during the inspection by the Judges, when 5s. will be charged. Tickets will be sent to all Members residing in the District connected with the Show—the counties of Inverness, Elgin, Ross and Cromarty, Sutherland, Caithness, and Nairn. Members residing in other localities must apply for Tickets at the Secretary's Office, 6 Albyn Place, Edinburgh, *not later than the 20th of July*.

2. Stock must be the property and in the possession of the Exhibitor from the date of the Entry.

3. Each column in the schedule of entry must be filled up so far as within the knowledge of the Exhibitor.

4. Stallions (except in Section 10) and aged Bulls must have had produce and, along with Two-year-old Bulls, have served within the year of the Show.

5. All Cows must have had calves previous to the Show, and when exhibited, they must either be in milk or in calf; if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 4 months after the Show.

6. Two-year-old Heifers—of the Short-horn and Polled Breeds—must be in calf when exhibited, and birth must be certified within 9 months after the Show.

7. Mares in Section 5 must have produced foals after 1st January 1865, and foals must be at foot except when death can be proved. Mares in Section 6 must be in foal, and awards will be suspended till birth is certified.

8. Ewes and Gimmers must be taken from regular breeding flocks; all Ewes must have reared lambs in 1865; and Ewes in Sections 7 and 11 (Cheviot and Blackfaced) must be in milk, and have their Lambs at foot. Fleeces must not be artificially coloured.

9. An animal which has gained a first premium at a General Show of the Society cannot again compete in the same class.

10. No animal shall bear on its rug, harness, pail, or other fittings, any initial, crest, or mark of ownership, nor be distinguished otherwise than by the number indicating its place in the Catalogue.

11. Except for Extra Stock Commendations will only be given for one lot in each Section—the fourth in merit.

12. The violation by an Exhibitor of any one of the Regulations will involve the forfeiture of all Premiums awarded to him.

13. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, the case shall be reported to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a Member, struck from the roll.

14. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity.

15. Protests against the awards of the Judges must be lodged with the Secretary not later than 10 A.M. on Wednesday, 2d August, and parties must be in attendance at the Committee-Room, in the Show-Yard, at 12, when protests will be disposed of.

16. The Society shall not be liable for any loss or damage which Stock, Implements, or other articles may sustain at the Show, or in consequence of having been sent to it.

17. The decisions of the Board of Directors are final in all questions respecting Premiums, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from any other tribunal.

18. The Premiums awarded will be paid after 1st November 1865, and may be taken either in money or in plate.

CERTIFICATES OF ENTRY FOR STOCK.

19. Every lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Friday the 16th of June*. Printed forms will be issued on application to the Secretary, or to Mr James Anderson, Solicitor, Inverness.

20. Admission-Orders to the Yard for Stock and Servants will be forwarded by post previous to the Show.

ENTRY-MONEY FOR STOCK.

21. Exhibitors, not Members of the Society, shall pay as Entry-Money for each lot of Stock 2½ per cent. on the highest Premium for which the Entry is made. Members may show three lots of Stock in each Section free, but must pay the same percentage on the Premium for each additional lot. The Entry-Money for Poultry is 2s. 6d. on each lot, and Members may show two lots free in each Section.

STALL RENT.

22. Covered accommodation will be provided for the whole of the Stock, and the following rates shall be paid by *all* Exhibitors at the time of making their Entries:—

	s.	d.
Stallions—3 year old—and 2 year old Entire Colts......	10	0
All other Horses and Cattle 2 years old and upwards....	7	6
Yearling Colts, Fillies, Bulls, and Heifers..................	5	0
Sheep and Swine, per pen..	5	0
Poultry, per coop...	2	6

ADMISSION OF STOCK.

23. The Yard will be open for Stock on Saturday, 29th July, and Monday, 31st July, and between Six and Eight o'clock on the morning of the 1st of August.

24. One Servant will be admitted in charge of each lot. Bulls must be secured by a nose ring, with chain or rope attached.

25. Cattle, Sheep, or Swine cannot be removed from the Yard till Five P.M. on Thursday, 3d August, except on certificate by the Veterinary Surgeon employed by the Directors.

26. Horses may be withdrawn at Six each evening on a deposit of £2 for each animal, which shall be forfeited if the animal is not brought back at Seven o'clock the following morning.

27. Servants in charge of Stock must bring their own buckets or pails. A first bedding for Horses, Cattle, and Swine, will be provided by the Society; but all other fodder and food for Stock will be supplied, at fixed prices hereafter to be published, by a Contractor employed by the Society. Any Servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, hay, nor straw.

PLACING AND JUDGING STOCK.

28. On Tuesday, 1st August, Exhibitors, and all others except Servants in charge of Stock, must leave the Yard at Eight A.M. The Judges will commence their inspection at Nine o'clock, when the public will be admitted. There shall be no award unless the Judges deem the animals to have sufficient merit, more especially if there is only one lot in the Section; and it shall be in their power to suggest the removal of any lot which appears to them unworthy of being placed in the Yard.

29. A Member of Committee will attend each Section of the Judges. It will be his duty to see that no obstruction is offered to them, and that the space reserved for them is not encroached on; to communicate to the Secretary any question that may arise for the consideration of the Committee; to complete their reports; and to ticket the prize animals.

30. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or Attending Member in any class in which he is competing; and no Exhibitor shall remain in charge of any lot, whether belonging to himself or another, while the Judges are in the Yard.

ADMISSION OF PUBLIC.

31. The public will be admitted to the Stock-Yard on Tuesday at 9 A.M., immediately before the inspection by the Judges commences. Holders of Members' tickets, and Exhibitors of Stock, will be charged 5s. for admission to the judging; all others, 10s. The space reserved for the Judges will be enclosed by ropes, and no encroachment will be permitted.

32. After 2 P.M. on Tuesday, Holders of Members' Tickets and Exhibitors will be admitted free. The charges to others will be—

TUESDAY, after 2 P.M., Half-a-Crown.

WEDNESDAY, from 8 A.M. till 1 P.M., Half-a-Crown; and after 1, One Shilling.

THURSDAY, from 8 A.M. till 5 P.M., One Shilling.

The Implement Yard will be open on Tuesday forenoon while the Stock is being judged; holders of Members' Tickets admitted free; others at 2s. 6d.; thereafter one payment admits to both Yards.

ENTRY OF IMPLEMENTS.

33. All articles must be entered with the Secretary on or before 16th June, and Exhibitors must intimate whether they wish their goods placed under cover or not, and specify the space they require. Shedding will be charged 1s. 6d. per lineal foot of frontage, with a depth of 20 feet, to Members, and 2s. to Non-members.

34. Members may show Implements free if shedding is not required, and Non-members will be charged sixpence per lineal foot.

35. When an Implement or Machine is supposed to embrace a new invention, or radical improvement, the nature of such must be specified in the entry, to enable the Directors to order an inspection with a view to a trial. Such trial, when recommended by the inspecting Committee, will be instituted in a convenient locality, and at a season of the year suitable for the operation of the implement or machine, which, when thoroughly tested, will be entitled to such a Premium as the Directors may see fit to award, on the report of the Judges employed by them.

PLACING IMPLEMENTS IN THE YARD.

36. The Yard will be open for the reception of Implements on Thursday, 27th July, and till Monday evening, 31st July.

37. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name and that of the Implement.

38. The articles of each Exhibitor will be all placed in one stand.

39. All articles must remain in the Yard till Five P.M. on Thursday, the 3d August, and may be kept there till the afternoon of Friday.

PLACING AND JUDGING POULTRY.

40. Poultry must be brought to the Show-Yard on Monday, 31st July, or on the morning of 1st August. No Lot will be admitted without an Admission-order. Coops, food, and attendance will be found by the Society.

41. No Lot to be removed from the Yard till Five o'clock on Thursday, the 3d August.

Premium Lists, Certificates of Entry, and Regulations, may be obtained by applying at the Secretary's Office, No. 6 Albyn Place, Edinburgh, or to Mr JAMES ANDERSON, Solicitor, Inverness.

The Secretary will be at the Union Hotel, Inverness, on Thursday and Friday, 15th and 16th June, to close the entries.

GENERAL SHOW OF STOCK AND IMPLEMENTS,

At GLASGOW, in 1866.

The District connected with the SHOW will comprise the COUNTIES of LANARK, ARGYLL, AYR, BUTE and ARRAN, and RENFREW.

Premiums will be offered for the following Classes :—

CATTLE.

AYRSHIRE.

Bulls calved before 1st January 1864
Bulls calved after 1st January 1864
Bulls calved after 1st January 1865
Cows in Milk calved before 1st January 1863
Cows in Milk calved after 1st January 1863
Cows in Calf of any age.
Heifers calved after 1st January 1864
Heifers calved after 1st January 1865

SHORT-HORN.

Bulls calved before 1st January 1864
Bulls calved after 1st January 1864
Bulls calved after 1st January 1865
Cows of any age.
Heifers calved after 1st January 1864
Heifers calved after 1st January 1865

POLLED ANGUS, OR ABERDEEN.

Bulls calved before 1st January 1864
Bulls calved after 1st January 1864
Bulls calved after 1st January 1865
Cows of any age.
Heifers calved after 1st January 1864
Heifers calved after 1st January 1865

POLLED GALLOWAY.

Bulls calved before 1st January 1864
Bulls calved after 1st January 1864
Bulls calved after 1st January 1865
Cows of any age.
Heifers calved after 1st January 1864
Heifers calved after 1st January 1865

HIGHLAND.

Bulls calved before 1st January 1863
Bulls calved after 1st January 1863
Bulls calved after 1st January 1864
Cows of any age.
Heifers calved after 1st January 1863
Heifers calved after 1st January 1864

EXTRA STOCK.

Oxen of any pure or cross breed calved after 1st January ...1863
Oxen of any pure or cross breed calved after 1st January ...1864
Highland Oxen calved after 1st January 1862
Highland Oxen calved after 1st January 1863
Cross-bred Heifers calved after 1st January 1864

HORSES

For Agricultural Purposes.

Stallions foaled before 1st January 1863
Entire Colts foaled after 1st January 1863
Entire Colts foaled after 1st January 1864
Entire Colts foaled after 1st January 1865
Mares (with Foal at foot) foaled before 1st January 1863
Mares (in foal) foaled before 1st January 1863
Fillies foaled after 1st January 1863
Fillies foaled after 1st January 1864
Fillies foaled after 1st January 1865

EXTRA HORSES.

Draught Horses or Mares in Harness.
Horses or Mares, not exceeding 15 hands, for milk carts of heavy draught.
Horses or Mares, not exceeding 14½ hands, for milk carts of light draught.

SHEEP.

LEICESTER.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

CHEVIOT.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

BLACKFACED.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

SOUTHDOWN.

Tups not more than four shear.
Ewes not more than four shear, or Gimmers.

LONG-WOOLLED OTHER THAN LEICESTER.

Tups not more than four shear.
Ewes not more than four shear, or Gimmers.

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

Tups not more than four shear.
Ewes not more than four shear, or Gimmers.

NOTE.—*Ewes and Gimmers to be exhibited in pens of five, and in the Cheviot and Blackfaced Breeds, Ewes must be in milk with lambs at foot.*

SWINE.

Boars, large breed.	Sows, large breed.
Boars, small breed.	Sows, small breed.

Pigs not above 8 months old, large breed.
Pigs not above 8 months old, small breed.

POULTRY.

COCK and TWO HENS, COCKEREL and TWO PULLETS, of the following breeds :—

Coloured Dorking.	Game.
White Dorking.	Any other Breed.
Coloured Cochin-China.	Bantams.
White Cochin-China.	White Aylesbury Ducks.
Bramahpootra.	Rouen Ducks.
Malay.	Any other Breed.
Spanish.	Black Norfolk Turkeys.
Golden Hamburg.	Any other Breed.
Silver Hamburg.	Geese.
Polish.	Capons (coops of three).

DAIRY PRODUCE.

BUTTER.—Cured, Powdered, and Fresh.

AGRICULTURAL EDUCATION.

The Bye-Laws enacted in 1856 have been superseded by the following Report, adopted by the Annual Meeting of the Society on 18th January 1865; and Bye-Laws to be framed in conformity with this Report, will be submitted, in terms of the Charter, for the approval of two successive General Meetings:—

REPORT BY COUNCIL ON EDUCATION AND COMMITTEE OF DIRECTORS.

The Council and Committee have carefully considered how the Society can most effectually promote Agricultural Education, and they now beg to submit the following suggestions for the consideration of the Directors:—

1. That the compulsory observance of a curriculum should be dispensed with, and that any course of study to be indicated should merely be suggestive and for the information of Students.

2. That the rule which at present requires two separate periods of two years each to be devoted to classes and to the farm respectively should be repealed, and that no certificates of attendance at either be required.

3. That the possession of the required knowledge shall be deemed a sufficient qualification for a Candidate, and that this should be determined solely by examination. That the Examination should be both written and oral; that the value of the answers should be determined by numbers; and that the oral examination should be public.

4. That there should be two Examinations, to be styled respectively the Certificate Examination and the Diploma Examination. The first to be open to Candidates not less than eighteen years of age, the second to those who have completed twenty-one years.

5. That to pass the Certificate Examination a Candidate must be acquainted with Farm Accounts, Mensuration, and Surveying, and must possess a good knowledge of Practical Agriculture, and a general acquaintance with the elements of Botany, Chemistry, and Natural History.

6. That a Certificate in the following terms, signed by the President or Vice-President of the Council on Education, and by the Secretary, should be granted to Candidates passing this Examination:—"We hereby certify that A. B. has been examined, and has been found to possess a knowledge of Farm Accounts, Mensuration, and Surveying, a good knowledge of Practical Agriculture, and a general acquaintance with the elements of Botany, Chemistry, and Natural History, and that he is therefore entitled to present himself for the further examination, in terms of the regulations, for the Society's Diploma."

7. That Candidates who possess this certificate, and have suffi-

pleted their twenty-first year, should receive the diploma, if found, on the final examination, to possess a thorough knowledge of the theory and practice of Agriculture; of Mechanics and Mensuration; of the physiology and treatment of Domesticated Animals, and of the applications of Botany, Chemistry, and Natural History to Agriculture.

8. That a sum not exceeding £100 per annum should be placed at the disposal of the examiners to be applied in prizes—the number and amount of which shall be afterwards fixed—to Candidates who pass with distinguished merit, and on a standard exceeding that required for the diploma.

The Council and Committee believe that the modifications of the existing system now suggested will tend to popularise and extend the operation of the Society's Educational Charter, and to stimulate Agricultural Education. It is expected that the facilities afforded for preparation, and the prizes and marks of distinction proposed to be conferred, together with the publicity which will be attached to the awards, will have the effect of inducing provincial schools to devote attention to the education of agriculturists, and to vie with each other in qualifying pupils for such competitions.

The Council and Committee recommend the Society to confine itself, at least for the present, to the exercise of such influence as has now been suggested. They cannot recommend the Society to establish direct relations with provincial or parochial schools. There are several objections to such a course. If prizes were to be offered, as has been suggested, to such schools, it would be difficult to regulate the number, or determine the status of the seminaries which should be entitled to claim them. Any attempt to draw a line of demarcation might appear invidious, and would be unpopular, and expose the Society to imputations of partiality. On the other hand, if no such line were fixed, the Society would, in all probability, find itself exposed to demands which could not be refused without giving offence, and which, if complied with, would encroach unreasonably on the resources of the Society. The offer of a prize involves likewise the necessity of an examination in each case, at the instance of the Society itself; and though the gratuitous and valuable co-operation of the learned professors and the other gentlemen who constitute the Board of Examiners, will enable the Society to conduct the proposed Certificate and Diploma Examinations in Edinburgh, the extension of a system of examination to the provinces would necessitate a staff far beyond that which it is in the power of the Society to organise. Other objections also might, if necessary, be stated against direct intervention in regard to the tuition given at parish schools and other local seminaries.

VETERINARY COLLEGE.

This establishment is conducted by Professor Dick, assisted by Dr Allen Dalzell, Dr Young, Mr Strangeways, and Mr Worthington. The curriculum embraces the Principles and Practice of Veterinary Medicine and Surgery, with Anatomy, Physiology, and Demonstrations; Chemistry; Materia Medica and Dietetics; and the general management of domesticated Animals.

Students have the advantage of assisting in an extensive practice, and of performing the different operations which most frequently occur.

Attendance on Two Courses is required before a Student is taken upon trial for diploma; the examinations are conducted by leading members of the Medical Faculty, and of the Veterinary Profession; Graduates of the College are eligible for appointment as Veterinary Surgeons in Her Majesty's Service.

The Session commences in the beginning of November, and is concluded before the end of April following.

MUSEUM.

The Museum, George IV. Bridge, is open from eleven till four o'clock every day, except Monday. The public are admitted on inscribing their names in the Visitor's Book. Persons desirous of preserving objects illustrative of the Vegetable products of the country are invited to transmit them to the Secretary.

CHEMICAL DEPARTMENT.

The objects of the Chemical Department are twofold:—

I. The prosecution of Researches in various subjects connected with Agricultural Chemistry, the results of which are published at intervals in the Transactions.

Dr Anderson will be glad at all times to receive suggestions from Members of the Society regarding subjects they may consider worthy of investigation, and which will be laid before the Chemical Committee.

II. The performance of Analyses of Manures, Soils, Vegetable Products, &c., for Members of the Society at reduced fees.

In purchasing manures, cattle foods, &c., Members are recommended, in all cases, to do so by guaranteed analysis, and to ascertain that the article delivered corresponds with it. Partial analyses, such as Nos. 6 and 7 of the accompanying List, will generally suffice to check the correspondence of the stock with the guarantee, and give an *approximate*, though not a precise estimate of its value. When an *exact* estimate is required, a complete analysis is necessary.

Samples intended for analysis should be sent (carriage paid) addressed to Dr ANDERSON, 15 SHUTTLE STREET, GLASGOW, and when of small size, they are most cheaply and expeditiously forwarded *by post*. They should be distinctly labelled, marked with the name and address of the sender in full, and accompanied by a letter, specifying the particular analysis required, according to its number in the following List,—and, if possible, the object in view,—as, by doing so, much trouble and delay will occasionally be saved.

Much inconvenience having been experienced by persons sending samples for Analysis which had not been selected with sufficient care, and were afterwards found not to represent the average composition of the substance, it is particularly requested that the following instructions may be attended to as closely as circumstances will permit:—

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

Manures.—A large double handful of the Manure should be taken from each of *at least* five or six different bags; and if any lumps are found in it, a due proportion of these should also be taken. The whole being laid on a large sheet of paper, should be carefully mixed by rubbing with the hand, the lumps being broken down and mixed as uniformly as possible with the powdery part. If this mixture be carefully made, a quantity of it not exceeding *two ounces* will suffice for the analysis. It should be folded up in

tinfoil to prevent its becoming dry, and is most cheaply and expeditiously forwarded by post. In default of tinfoil, the sample may be wrapped in double folds of strong writing paper. Should the manure contain stones, or be very moist, or should any difficulty be experienced in making a uniform mixture, it is desirable that *two or three pounds* should be sent.

Soils.—In selecting Soils for analysis, five or six spadefuls should be taken from different parts of the field, and, after being spread out in a thin layer for several days to dry, should be put two or three times through a fine sieve, so as to insure uniform mixture. For a complete analysis, not less than *two pounds* should be sent: for a partial analysis, three or four ounces will be sufficient.

Waters.—For the complete analysis of a Water, from *two to three gallons* are required; for the determination of the amount of salts in solution, and lime thrown down by boiling, *two quarts* will suffice. A well-water may be selected at any time; but the water of a spring or running stream should be taken in dry weather. The jars or bottles in which they are sent must be tightly corked and sealed. In the analysis of a mineral water, it may sometimes be desirable to determine the amount of gases held in solution; in which case certain precautions must be observed which require the presence of a chemist at the spring.

Limestones, Clays, Ironstones, &c.—If the bed of any of these substances of which the analysis is required be very uniform in appearance, a piece of two or three ounces weight, taken from any part of it, will be enough for analysis; but in all cases it is better to send three or four chips from different parts of its thickness. Sometimes where the characters of different parts of the bed vary much, separate analyses of these portions may be requisite, in which case two ounces of each may be sent.

The following are the rates at which Analyses, &c., are furnished to *Members of the Society*, and it is requested that the fee be remitted along with the sample:—

1. Complete analysis of a Soil, including determination of Alkalies and Phosphates, £3.
2. A partial analysis of a Soil, such as the determination of the quantity of Organic Matter, and relative proportion of Clay, Sand, and Carbonate of Lime it contains, 10s.
3. Quantitative determination of any one ingredient of a Soil, 7s. 6d.
4. Complete analysis of Saline Manures and other substances, such as Gypsum, Nitrates of Soda and Potash, Ammoniacal Salts, Guano, Oil-cake, Bone-dust, Rape-dust, Superphosphate of Lime, £1.

5. Testing the above substances for adulterations,—for each sample, 5s.

    This examination is generally sufficient to determine whether or not any of these substances are grossly adulterated, but it gives no idea of the comparative value of different Samples, where all are genuine.

6. Determination of the percentage of Phosphates and Ammonia in a Guano, 10s.
7. Determining the quantity of Soluble and Insoluble Phosphates in a Superphosphate, 10s.

    This and the preceding determination generally suffice to show whether the sample is of fair quality, and corresponds with the analysis by which it was sold, but not to fix its exact commercial value.

8. Complete analysis of Limestones, Marl, Shell-sands, &c., £1.
9. Examining any of the above substances for the quantity of Lime, and ascertaining in the same the presence of Magnesia and Alumina, 7s. 6d.

    Ascertaining the proportion of these, 2s 6d. additional for each substance.

10. Complete analysis of the Ash of any Plant, £3.
11. Complete analysis of a Water, £2.
12. Determination of the amount of Salts in Solution and of the Lime thrown down by boiling in any water, 10s.
13. Analysis of Tile or Fire Clay, £1, 10s.
14. Complete analysis of Roots, Grains, and other Vegetable Products, £1.
15. Examining products of Vegetation, or of the Dairy, such as Nutritive Matters in Wheat, or other grain—quantity of Butter or Cheese in Milk—5s. for each ingredient.
16. Determination of the quantity of Nitrogen in any substance, 7s. 6d.
17. Answers to letters asking advice on subjects within the department of the Chemist, 5s.

The charges for other Analyses not specified in the list will be settled by the Committee of Management, with reference to the amount of work which they involve, and on a scale similar to the above.

J[s]. HALL MAXWELL, *Secretary.*

EDINBURGH, 6 ALBYN PLACE,
3d February 1865.

LIST OF MEMBERS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

1865.

ALPHABETICALLY ARRANGED, AND DISTINGUISHING THE YEAR OF ADMISSION.

The Members marked * have been Presidents; and † Vice-Presidents.

New Members are admitted at the Annual Meeting in January, and the Summer General Meeting in June or July. The ordinary subscription is £1, 3s. 6d. annually, which may be redeemed by one payment, varying from £12, 12s. to £7, 1s., and regulated by the number of previous annual payments. Tenant Farmers, Secretaries and Treasurers of local Agricultural Associations, resident Agricultural Factors, and Proprietors farming the whole of their own lands, whose assessment on the valuation-roll does not exceed £500, are admitted on a subscription of 10s. annually, or £5, 5s. for life.

EDINBURGH:
PRINTED BY NEILL AND COMPANY.
MDCCCLXV.

LIST OF MEMBERS.

Admitted

His Majesty NAPOLEON III., Emperor of the French, *Honorary Associate* 1856

His Royal Highness The PRINCE OF WALES, *Honorary Member* - 1864

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*ARGYLL, His Grace George, Duke of, K.T., President of the Society 1844

ATHOLE, His Grace John, Duke of 1860

ATHOLE, Her Grace Ann, Dowager Duchess of 1841

ABERCORN, The Most Noble James, Marquis of, K.G. 1833

†AILSA, The Most Noble Archibald, Marquis of, K.T. 1847

†AIRLIE, The Right Hon. David, Earl of, K.T. 1852

ARBUTHNOTT, The Right Hon. John, Viscount 1833

10 ABERCROMBY, The Right Hon. George, Lord 1862

ARBUTHNOTT, General the Hon. Sir Hugh, M.P. 1811

ARDMILLAN, The Hon. Lord 1853

AGNEW, Sir Andrew of Lochnaw, Bart., M.P. 1850

ABERCROMBY, Sir George S., of Birkenbog, Bart. 1850

ANSTRUTHER, Sir Wyndham Carmichael, of Anstruther and Carmichael, Bart. 1842

ANSTRUTHER, Sir Robert, of Balcaskie and Watten, Bart., M.P. 1862

ANTROBUS, Sir Edmond, of Rutherford, Bart. 1829

ARBUTHNOT, Sir Robert Keith, Bart. 1852

ALISON, Sir Archibald, Bart., Sheriff of Lanarkshire 1838

20 ALEXANDER, Sir James Edward, of Westerton 1831

AITCHISON, General Sir John, K.C.B. 1852

		Admitted
	ANDERSON, Sir Alexander, of Blelack, Aberdeen	1838
	Abercromby, Alexander, Glasgow	1844
	Adair, John, of Genoch, Stranraer	1829
	Adam, Alexander Forsyth, W.S., Edinburgh	1859
	Adam, Alexander, of Lynegar, Wick,	1862
	Adam, Æneas, Humbertson, Dingwall	1855
	Adam, James, S.S.C., Edinburgh	1842
	Adam, John, Closeburn, Thornhill	1860
30	Adam, Stephen, Wool-Merchant, Leith	1856
	Adam William, of Ranna, Advocate, Aberdeen	1839
	Adam, William, Bush, Banchory	1857
	Adam, William Patrick, of Blair-Adam, M.P.	1853
	Adams, John, junior, S.S.C., Edinburgh	1860
	Adamson, James, Morphie, Montrose	1850
	Adamson, Laurence, Bankhead, Leven	1858
	Adamson, Samuel, of Drumclyre, Dumfries	1859
	Addie, Robert, of Viewpark, Uddingston	1844
	Adie, Alexander James, Linlithgow	1859
40	Agnew, Robert Vans, of Shenchan, Stranraer	1843
	Aiken, Alexander, Meikle Endovie, Alford	1858
	Aikman, Thomson, Glasgow	1857
	Ainslie, Daniel, of the Gart, Callander	1864
	Ainslie, David, of Costerton, Blackshiels	1859
	Ainslie, John, Hillend, Pentland, Loanhead	1848
	Ainslie, Robert, of Elvingston, Gladsmuir	1853
	Ainslie, William, junior, Moat, Roslin	1857
	Aitchison, James	1851
	Aitchison, William, Linhope, Hawick	1835
50	Aitchison, William, junior, Linhope, Hawick	1863
	Aitken, Alexander, Edinburgh	1857
	Aitken, George, Tyrie, Kirkcaldy	1861
	Aitken, James, of Beechwood, Partick	1857
	Aitken, James, Sunnyside, Prestonkirk	1854
	Aitken, John, Brucehill of Cardross, Stirling	1861
	Aitken, John Gillespie, Stirling	1864
	Aitken, Robert, Skeroblinraid, Campbeltown	1857
	Aitken, Thomas, Leith	1860
	Aitken, Thomas, Listonshiels, Balerno	1854
60	Aitken, William, Chapel Colliery, Wishaw	1855
	Alexander, Alexander Humphreys	1825
	Alexander, Charles, Inversanda, Ardgour	1856
	Alexander, Lieut-Colonel Claude, of Ballochmyle	1862
	Alexander, Ebenezer, Taylortown, Stirling	1857
	Alexander, James, Seed-Merchant, Edinburgh	1857

		Admitted
	Alexander, James, of Balmule, Dunfermline	1842
	Alexander, John, Ochterlony House, Forfar	1855
	Alexander, Thomas, Corn Factor, Perth	1861
	Alexander Wm., Bent of Haulkerton, Laurencekirk	1858
70	Alison, Alexander, Glasgow	1844
	Alison, Thomas, of Calder Mill, Carstairs	1854
	Allan, Alexander, Advocate, Edinburgh	1833
	Allan, Alexander, Drummond, Evanton	1853
	Allan, Alexander, West Park, Auchterarder	1861
	Allan, Alexander, Carbarns, Wishaw	1864
	Allan, Lieut.-Colonel, Edinburgh	1847
	Allan James, Clifton Mains, Kirkliston	1851
	Allan, James, Clauchan, Arran	1855
	Allan, James, West Mains, Stonehouse,	1852
80	Allan, James D., Culthill, Dunkeld	1863
	Allan, James R., Inveramsay, Pitcaple	1858
	Allan, John, Billie Mains, Ayton	1854
	Allan, John, Crieffvechter, Crieff	1861
	Allan, Richard, Howden, Jedburgh	1863
	Allan, Robert A., Greenburn, Ayton	1863
	Allan Thomas, Fogorig, Dunse	1853
	Allan, Thomas, Westerwood, Cumbernauld	1857
	Allan, Thomas William Murray, of Havering, Essex	1852
	Allan, William, Edinburgh	1830
90	Allen, James, Merchant, Glasgow	1815
	Allman, George James, M.D., Professor of Natural History, University of Edinburgh	1858
	Alston, George, of Craighead, Hamilton,	1864
	Alston, James W., of Stockbriggs, Lesmahagow	1844
	Alston, John Patrick, of Muirburn, Strathaven	1850
	Amos, James, Deanfoot, Minto	1863
	Amos, Thomas, Earlside, Hawick	1863
	Anderson, A.D., M.D., Glasgow	1844
	Anderson, David, of Moredun, Edinburgh	1825
	Anderson, David, of St Germains, Prestonpans	1829
100	Anderson, David, Westhaven, Carnoustie	1843
	Anderson, David, North Mains of Ethie, Arbroath	1858
	Anderson, George, Solicitor, Inverness	1839
	Anderson, George, Glasgow	1844
	Anderson, George, of Woodhouse, Kirtlebridge	1862
	Anderson, George, Broomhill, Selkirk	1863
	Anderson, George B., Meikle Pinkerton, Dunbar	1859
	Anderson, Henry, of Chapel, Kirkcaldy	1857
	Anderson, Henry, Burnside, Stanley	1861

		Admitted
	Anderson, James,	1839
110	Anderson, James,	1838
	Anderson, James, Newbigging, Dundee	1863
	Anderson, James, Solicitor, Inverness	1865
	Anderson, John, Lewinshope, Selkirk	1852
	Anderson, John, Merchant, London	1838
	Anderson, John, Merchant, Glasgow	1838
	Anderson, John, Craigton, Banchory	1857
	Anderson, John, Pratis, Largo	1857
	Anderson, John, Smithson, Kilsyth	1859
	Anderson, John, Braes of Foss, Pitlochry	1860
120	Anderson, Lawrence, Chapel, Moffat	1851
	Anderson, Peter, Gillespie, Glenluce	1864
	Anderson, Robert, of Lochdu, Nairn	1856
	Anderson, Robert H., Burleigh, Kinross	1861
	Anderson, Robert Hood, Glasgow	1850
	Anderson, Robert Wm., Clerk of Supply, Forfar	1858
	Anderson, Stephen	1849
	Anderson, Thomas, of Glendrisaig, Kilmarnock	1832
	Anderson, Thomas, M.D., Professor of Chemistry, University of Glasgow, Chemist to the Society	1849
	Anderson, Thomas Scott, W.S., Edinburgh	1854
30	Anderson, William, Ballimore, Tigh-na-bruaich	1865
	Anderson, William, Hattonburn, Banchory	1857
	Anderson, William, New Mill, Banchory	1857
	Anderson, William James, Edinburgh,	1840
	Andrew, Hugh, Keprigan, Campbeltown,	1857
	Angus, John, junior, Whitefield, Morpeth	1863
	Anstruther, James, W.S.	1827
	Anton, James, Coltfield, Forres	1858
	Arbuthnot, George Clerk, of Mavisbank, Loanhead	1844
	Arburthnot, Thomas, of Meethill, Peterhead	1829
140	Arbuthnott, James Carnegy, of Balnamoon, Brechin	1813
	Archbald, Thomas, Carrington Mains, Lasswade	1855
	Archer, Andrew, Jordanstoun, Meigle	1846
	Archer, Thomas, Arndean, Dollar	1864
	Archibald, James, Brodick, Arran	1861
	Archibald, John, Duddingstone, South Queensferry	1849
	Arklay, John, Gorthlick, Inverness,	1853
	Arklay, Robert, of Ethiebeaton, Dundee,	1861
	Arkley, Patrick, of Duninald, Advocate, Edinburgh	1854
	Arkley, Robert H., Duninald, Montrose,	1850
150	Armour, Alex. B., Meiklehill, Kirkintilloch	1854
	Armstrong, Charles, of Cherry Valley, Antrim	1836

		Admitted
	Armstrong, James, Effgill, Langholm	1860
	Arnot, David, Adamston, Auchterhouse	1862
	Arnott, G. A. Walker, of Arlary, LL.D., Professor of Botany, University of Glasgow	1837
	Arnott, James, of Leithfield, W.S., Edinburgh	1835
	Arras, Walter, Ormiston, Kelso	1862
	Arres, William, Wester Delnies, Nairn	1865
	Arthur, John	1857
	Arundell, W. F. Hunter, of Barjarg, Dumfries	1858
160	Askew, Henry William	1845
	Askew, Watson, of Pallinsburn, Coldstream	1863
	Astley, F. D. P., of Arisaig, Fort-William	1865
	Austin R. Speir	1851
	Aytoun, James, Advocate, Edinburgh	1849
	Aytoun, Roger S., of Inchdairnie, M.P., Kirkcaldy	1844
	Aytoun, William Edmonstoune, D.C.L., Sheriff of Orkney and Shetland, Edinburgh	1838

	*Buccleuch and Queensberry, His Grace Walter, Duke of, K.G.	1828
	Buccleuch and Queensberry, Her Grace Charlotte, Duchess of	1835
	Bowmont, The Most Noble James, Marquis of	1863
170	†Blantyre, The Right Hon. Charles, Lord	1843
	†Belhaven and Stenton, The Right Hon. Lord, K.T.	1816
	†Binning, The Right Hon. George, Lord	1857
	Boyle, The Hon. George Frederick, M.P.	1854
	Bruce, The Hon. Thomas Charles	1852
	Burnett, Sir James Horn, of Leys, Bart.	1834
	Bruce, Sir William C., of Stenhouse, Bart.	1864
	Bannerman, Sir Alex., of Crimonmogate, Bart.	1858
	Baird, Sir James Gardiner, of Saughton Hall, Bart.	1843
	Blair, Sir Edward Hunter, of Blairquhan, Bart.	1850
180	Baird, Sir David, of Newbyth, Bart.	1860
	Baillie, Sir William, of Polkemmet, Bart.	1847
	Boswall, Sir George Houstoun, of Blackadder, Bart.	1848
	Baxter, Sir David, of Kilmaron, Bart.	1843
	Baikie, James, of Tankerness, Kirkwall	1818
	Baillie, Evan, of Dochfour, Inverness	1824
	Baillie, Henry James, younger of Redcastle, M.P.	1839
	Baillie, Colonel Hugh Duncan, of Redcastle, Beauly	1839

		Admitted
	Baillie, James William, of Culterallers, W.S., Biggar	1851
	Baillie, John Menzies, C.A., Edinburgh	1865
190	Bain, John, of Morriston, Glasgow	1833
	Bain, James, New Grange, St Andrews	1864
	Bain, Edwin Sandy, of Livelands, Stirling	1864
	Baird, Charles J.	1844
	Baird, George, of Strichen, Aberdeen	1838
	Baird, Henry, Abbots Grange, Grangemouth	1853
	Baird, James, of Knoydart, Cambusdoon, Ayr	1838
	Baird, John, of Ury, Stonehaven	1838
	Baird, William, Grain-Merchant, Glasgow	1844
	Balfour, Arthur J., of Whittingham, Prestonkirk	1863
200	Balfour, Charles, of Balgonie, Markinch	1846
	Balfour, David, of Balfour and Trenabie, Kirkwall	1843
	Balfour, Major Fras. W., of Fernie Castle, Letham	1857
	Balfour, James, Milton, Leuchars	1842
	Balfour, John, of Balbirnie, Markinch	1839
	Balfour, John Hutton, M.D., Professor of Botany, University of Edinburgh	1839
	Balfour, Major-General, of Arbigland, Dumfries	1849
	Balfour, William, of Birstane, Kirkwall	1844
	Ballantyne, James, of Castlehill, Ayr	1822
	Ballantyne, James, of Holylee, Innerleithen	1832
210	Ballantyne, John, junior, Seedsman, Dalkeith	1860
	Ballantyne, Thomas, Whitehope, Selkirk	1852
	Ballingal, Neil, Bingartree House, Leslie	1851
	Ballingall, Robert, Eallibus, Islay	1853
	Ballingall, David, Factor, Blairdrummond	1857
	Ballingall, George, Ayton, Cupar-Fife	1860
	Ballingall, John, Dunbog, Newburgh	1861
	Ballingall, William, Sweetbank, Markinch	1859
	Balmer, Thomas, Gordon Castle Fochabers	1863
	Bankes, Meyrick, of Letterewe, Dingwall	1862
220	Barbour, George F., of Bonskeid, Pitlochry	1859
	Barbour, Thomas, of Dalshangan, Carsphairn	1846
	Barclay, Arthur Hay, of Paris, Perthshire	1848
	Barclay, Charles A., Aberdour House, Fraserburgh	1858
	Barclay, George, Davochbeg, Golspie	1855
	Barclay, George, Yonderton, King Edward	1858
	Barclay, George Robertson, of Keavil, Dunfermline	1834
	Barclay, James Wm., Auchlossan, Lumphanan	1862
	Barclay, Colonel P., Edinburgh	1847
	Barclay, Robert, Drums, Falkland	1859
230	Barclay, Thomas, Montrose	1855

		Admitted
	Bardner, James, Chesterstone, Largo	1859
	Barker, Thomas, of Sydney, Australia	1839
	Barlas, Robert, Edinburgh	1844
	Barns, Patrick Graham, of Limekilns, East Kilbride	1836
	Barr, James, Silvertonhill, Hamilton	1847
	Barr, James, Law Colliery, Carluke	1862
	Barr, John, Harperland, Kilmarnock	1851
	Barrie, James, Harden Mains, Jedburgh	1863
	Barron, George, Pittenkerie, Banchory	1857
240	Barstow, Charles M., Accountant, Edinburgh	1846
	Bartholomew, James, Duntarvie, Winchburgh	1855
	Bartholomew, John, of Broomhill, Merchant, Glasgow	1838
	Bartholomew, Robert, Merchant, Glasgow	1838
	Bathgate, James, Windymains, Upper Keith	1861
	Baxter, Edmund, W.S., Edinburgh	1854
	Baxter, George, Craigforthie, Keith Hall	1858
	Bayley, Isaac, of Manuel, Edinburgh	1828
	Bayne, John, Bridge of Allan	1864
	Bayne, William, Cattle-Dealer, Cupar-Fife	1862
250	Beach, Joseph, Miller, Dudley	1865
	Beattie, James, Newbie House, Annan	1854
	Beattie, Peter, Dunnydeer, Insch	1858
	Begbie, Alexander, Barneyhill, Dunbar	1864
	Begbie, Thomas, Queenston Bank, Drem	1852
	Begg, David, of Canons Park, Edgeware, London	1862
	Begg, John, Distiller, Balmoral, Crathie	1858
	Beith, John, Grain-Dealer, Rothesay	1857
	Beith, John, Banker, Campbeltown	1836
	Belany, Charles, Hillend, Ayton	1854
260	Belfrage, George, North Gyle, Corstorphine	1849
	Belfrage, James, Samuelston East Mains, Haddington	1849
	Bell, David, Todhall, Cupar-Fife	1856
	Bell, George, Inchmichael, Errol	1852
	Bell, George Graham, of Crurie, Advocate	1835
	Bell, James, Woodhouselees, Canonbie	1863
	Bell, John, Glenduckie, Newburgh, Fife	1859
	Bell, John, of Enterkine, Tarbolton	1839
	Bell, John, Edinburgh	1863
	Bell, John Beatson, W.S., Edinburgh	1841
270	Bell, Robert, of Lunna, Sheriff-Substitute, Lerwick	1846
	Bell, Thomas, Moile of Cantyre, Campbeltown	1854
	Bell, Thomas, Ballinshoe, Kirriemuir	1856
	Bell, Thomas, Glentarkie, Strathmigle	1865

		Admitted
	Bell, William, Edinburgh	1855
	Bennet, Alexander, Deskie, Ballindalloch	1857
	Bennet, James, Marypark, Ballindalloch	1857
	Benton, Joseph, Cattie, Whitehouse	1858
	Benton, William, Harthill, Whitehouse	1858
	Berry, John, of Tayfield, Tayport	1848
280	Berry, Walker, Edinburgh	1863
	Bertram, George, Engineer, West Sciennes, Edinburgh	1860
	Bertram, James, Hartside, Lauder	1864
	Bertram, John S., Cranshaws, Dunse	1854
	Bertram, Thomas Hardy, Engineer, London	1845
	Bertram, William, of Nisbet, Biggar	1852
	Bertram, William, Limielands, Smeaton, Dalkeith	1862
	Berwick, David, Denbrae, St Andrews	1861
	Bethune, Vice-Admiral, of Balfour, C.B., Markinch	1857
	Bethune, Alexander, of Blebo, Cupar-Fife	1848
290	Bethune, Major Robert, of Nydie	1863
	Bethune, Murdo, Dreim, Beauly	1864
	Bett, David J., Flatfield, Cupar-Angus	1861
	Bett, James, Easdale, Oban	1857
	Beveridge, David, Buckhorn, Largo	1859
	Beveridge, George, Orrick, Burntisland	1862
	Beveridge, James, Easter Balado, Kinross	1851
	Beveridge, Robert E., Urquhart, Dunfermline	1853
	Beveridge, William, Orrick, Burntisland	1862
	Bigg, Thomas. London	1842
300	Biggar, Thomas, of Chapleton, Haugh of Urr	1858
	Binnie, John, Eshiels, Peebles	1859
	Binnie, Robert, Seton Mains, Longniddry	1847
	Binning, John, Brae, Dingwall	1849
	Binny, Graham, W.S., Edinburgh	1865
	Bird, James, B., Fishwick, Paxton	1858
	Biscoe, Thomas Porter Bonell, of Newton, Inverness	1846
	Bisset, The Ven. Archdeacon, of Lessendrum, Huntly	1862
	Black, Adam, M.P., Edinburgh	1846
	Black, Alexander, Civil-Engineer, Falkirk	1856
310	Black, David, Barrelwell, Brechin	1850
	Black, James, London	1851
	Black, James, Merchant, Glasgow	1838
	Black, James, Knock, Keith	1852
	Black, James, Spens, Merchant, Glasgow	1839
	Black, James, W., Wandelmill, Abington	1857
	Black, John, of Tilliwhally, Kinross	1851

		Admitted
	Black, John, Fern Bank, Bishopbriggs	1855
	Black, John, Seton Hill, Prestonpans	1859
	Black, John, Westfield, Coldstream	1859
320	Black, Robert, Glasgow	1844
	Blackburn, Peter, of Killearn, M.P.	1842
	Blackburn, Robert, B., Advocate, Edinburgh	1846
	Blackie, Archibald Gibson, Peebles	1858
	Blackie, John, junior, Lord Provost of Glasgow	1865
	Blackley, John, Glasgow	1855
	Blacklock, Adam, Minnygap, Moffat	1857
	Blackwood, John, Publisher, Edinburgh	1842
	Blackwood, William, Publisher, Edinburgh	1862
	Blair, Alexander, Brewer, Alloa	1864
330	Blair, Campbell, Glasgow	1864
	Blair, Col. Stopford, of Penninghame, Newton-Stewart	1849
	Blair, James, of Glenfoot, Tillicoultry	1860
	Blair, James, Rowardennan, Luss	1864
	Blair, John, Clayhills, Cambusbarron, Stirling	1864
	Blair, Mrs Fergusson, of Inchmartine, Inchture	1864
	Blair, Thomas, Bankhead, Ceres	1857
	Blair, William, of Avontoun, Linlithgow	1817
	Blair, Captain William Fordyce, of Blair, R.N., Dalry	1844
	Blandow, M. Von. St Petersburg, Hon. Associate	1836
340	Blane, Col. Robert, C.B.	1836
	Blanshard, George, Merchant, Edinburgh	1847
	Blues, Andrew A., Dalruscan, Tinwald, Dumfries	1861
	Blyth, David, Leckiebank, Auchtermuchty	1861
	Bogie, Alexander, of Newmill, Cupar-Fife	1860
	Bogie, James, Newport, Fifeshire	1864
	Bogie, John, Balcanquhall, Auchtermuchty	1851
	Bogie, William, Balneil, Colinsburgh	1861
	Bolam, John, Glororum, Belford	1854
	Bolam, John, junior, Chathill, Northumberland	1863
350	Bolton, Joseph C., of Carbrock, Falkirk	1858
	Bonar, Andrew, Australia	1824
	Bonar, James, Merchant, London	1835
	Bonar, William, of East Warriston, Edinburgh	1828
	Bonar, William Graham, of Greigston, Ceres	1835
	Bontine, Wm. Cuninghame Graham, of Gartmore	1853
	Booth, James Godfrey, Seed-Merchant, Hamburg	1842
	Borland, Robert, Auchencairn, Closeburn	1862
	Borthwick, Alex. Hay, Mosspeeble, Langholm	1859
	Borthwick, Gilbert, Cowbog, Kelso	1854

		Admitted
360	Borthwick, John, Greenlees, Kelso	1863
	Borthwick, John, V.S., Kirkliston,	1858
	Borthwick, John, of Crookston, Gorebridge	1846
	Borthwick, John James M., Georgefield, Langholm	1859
	Borthwick, Thomas Chalmers, Hopsrig, Langholm	1838
	Borthwick, Wm. Henry	1857
	Borton, John, Barton House, Malton	1864
	Bosomworth, John, Abernethy	1861
	Bowhill, James, Banker, Ayton	1863
	Bowie, Alexander, Mains of Kelly, Arbroath	1854
370	Bowie, Peter, Carlogie, Carnoustie	1858
	Bowman, James, Newark, Pittenweem	1859
	Bowman, Thomas, Halhill, Baillieston	1855
	Boyd, James B., Doddington, Wooler	1853
	Boyd, John B., of Cherrytrees, Kelso	1861
	Boyd, William B., Hetton Hall, Belford	1863
	Boyle, Patrick, of Shewalton, Irvine	1835
	Boyle, Robert, Tile Manufacturer, Ayr	1850
	Braid, Andrew, Humbie, Kirknewton	1865
	Brand, Charles, Mains of Fordoun, Fordoun	1858
380	Brand, William, Secretary, Union Bank of Scotland	1846
	Brander, James, Avoch, Fortrose	1830
	Brash, James, Hallyards, Kirkliston	1855
	Brebner, James, Advocate, Aberdeen	1834
	Broad, William, Clifton-hill, Kelso	1853
	Broadwood, David, of Fullfordlees, Crowhill, Dunbar	1865
	Brock, John, Overton, Kirkliston	1858
	Brockley, Robert M., Gourlaw, Lasswade	1857
	Brodie, James, Banker, Kirriemuir	1859
	Brodie, James, Leaston, Blackshiels	1848
390	Brodie, John Clerk, W.S., Edinburgh	1840
	Brodie, Patrick, Clarilaw, Selkirk	1834
	Brodie, K.S., Edinburgh	1860
	Brodie, William, of Brodie, Forres	1821
	Brody, George, Gillingshill, Pittenweem	1864
	Broomfield, Thomas, Lauder	1855
	Brotchie, Robert, of Swanny, Leith	1855
	Broughton, Robert Henry, of Rowchester, Greenlaw	1854
	Brown, Adam, Helmburn, Selkirk	1863
	Brown, Alex. J. Dennistoun, of Balloch, Dumbarton	1844
400	Brown, Andrew, M.D.	1852
	Brown, Archibald, Craig, Udny	1858
	Brown, Charles, Factor, Gartmore, Stirling	1857

		Admitted
	Brown, Major David, of Park, Corstorphine	1834
	Brown, George, Watten Mains, Wick	1839
	Brown, George, Balgarvie, Cupar-Fife	1851
	Brown, George, Westerton, Fochabers	1858
	Brown, Hugh H., of Newhall, Penicuik	1843
	Brown, James, Hargrave, Annan	1860
	Brown, James, of Lochton, Dundee	1843
410	Brown, James, of Orchard, Carluke	1849
	Brown, James, Clephanton Cottage, Anstruther	1861
	Brown, James, Liberton Mains, Carnwath	1855
	Brown, James Bertram, Smeaton, Dalkeith	1848
	Brown, James T., of Auchlochlan, Lesmahagow	1837
	Brown, John, Outerston, Gorebridge	1856
	Brown, John, Boghall, Biggar	1857
	Brown, John, Inglistone, Irongray, Dumfries	1860
	Brown, John George, Auchlochan	1852
	Brown, J. Carruthers, Bridekirk Mains, Annan	1860
420	Brown, Jonathan,	1857
	Brown, Matthew, Greenock	1832
	Brown, Dr William, Melrose	1855
	Brown, Oliphant, Glenlee, New Galloway	1861
	Brown, Peter, Linkwood, Elgin	1821
	Brown, Peter, Rossland, Paisley	1856
	Brown, Robert, Auctioneer, Balfron	1856
	Brown, Robert, Sandyflat, Maryhill	1857
	Brown, Thomas, Slipperfield, West Linton	1849
	Brown, Thomas, Holm, Thornhill	1863
430	Brown, Thomas, Ruletownhead, Bonchester Bridge	1863
	Brown, Thomas, Secy. Agricul. Soc., Campbeltown	1863
	Brown, Walter, of Colton, Dunfermline	1854
	Brown, William, Merchant, Glasgow	1828
	Brown, William, Banker, Maybole	1835
	Brown, William, Merchant, Dundee	1843
	Brown, William, Linkwood, Elgin	1854
	Brown, William, Factor, Invercauld, Braemar	1861
	Brown, William Henry, of Ashley, Ratho	1833
	Bruce, A., Wealtherton of Keig, Whitehouse	1858
440	Bruce, C. L. Cumming, of Roseisle & Kinnaird, M.P.	1817
	Bruce, Charles, Broadland, Huntly	1862
	Bruce, George, Hayfield, Lerwick	1864
	Bruce, James, Burnside, Fochabers	1865
	Bruce, John, of Sumburgh, Zetland	1829
	Bruce, John, junior, Sumburgh, Shetland	1863
	Bruce, John, W.S., Edinburgh	1842

		Admitted
	Bruce, Peter, St Bernard's Cottage, Edinburgh	1865
	Bruce, Thomas, of Arnot, Kingsdale, Kennoway	1855
	Bruce, William, of Symbester, Zetland	1838
450	Bryce, David, Architect, Edinburgh	1846
	Bryce, Rev. James, D.D., Edinburgh	1813
	Bryce, James, East Whitburn, Whitburn	1865
	Brydon, Adam, Netherbarns, Galashiels	1862
	Brydon, Herbert, Thirlestane Hope, Ettrick	1864
	Brydon, James, Moodlaw, Langholm	1850
	Brydon, James, junior, Kinnelhead, Moffat	1864
	Brydon, John, Netherbarns, Galashiels	1857
	Brydon, Walter, Burncastle, Lauder	1863
	Bryson, Robert, Merchant, Glasgow	1850
460	Bryson, W. G., Cullen	1852
	Buchan, Colonel Fordyce, of Kelloe, Edrom	1857
	Buchan, Matthew, Beechwood Mains, Corstorphine	1861
	Buchan, William, Dolphinton, South Queensferry	1839
	Buchanan, Alexander, Whitehouse, Stirling	1854
	Buchanan, Alexander, Garscadden, East Kilpatrick	1857
	Buchanan, Andrew, of Mount Vernon, Shettleston	1827
	Buchanan, Andrew, of Auchintorlie, Dunglass	1838
	Buchanan, David Carrick, of Drumpellier, Coatbridge	1849
	Buchanan, Duncan, Auchnabreck, Cairndow	1853
470	Buchanan, Isaac, Canada	1851
	Buchanan, James, Glasgow	1838
	Buchanan, John, London	1838
	Buchanan, John, of Glenlora, Lochwinnoch	1844
	Buchanan, John, of Carbeth, Killearn	1838
	Buchanan, John, Coldrach, Drymen	1857
	Buchanan, Robert, Glasgow	1811
	Buchanan, Robert M., Livingston Mill, Mid Calder	1864
	Buchanan, Thomas Gray, of Wellshot, Glasgow	1849
	Buchanan, Walter, of Shandon, M.P.	1842
480	Buchanan, William, Merchant, Glasgow	1828
	Buckham, George, Kers Mains, Kelso	1863
	Budge, Henry, C.A., Edinburgh	1864
	Buist, James, Kirkton Barns, Newport	1842
	Buist, Mathew, Tynninghame, Prestonkirk	1848
	Buist, Robert, Blairlogie, Stirling	1863
	Burn, Henry J., Cuttlehill, Crossgates	1843
	Burn, John, Ednam, Kelso	1863
	Burn, Robert Scott, Highfield Lodge, Manchester	1860
	Burn, William, Architect, London	1824
490	Burns, John William, yr. of Kilmahew, Dumbarton	1861

	Admitted
Burnet, James, Aberlady, Drem	1854
Burnett, Alexander, Calduthel, Inverness	1839
Burnett, George, Advocate, Edinburgh	1848
Burnett, Gregory, Dee Cottage, Flint	1840
Burnett, Newell, Advocate, Aberdeen	1834
Burnett, Robert, yr. of Leys, Crathes, Aberdeen	1858
Burroughs, Lieut.-Col. W. F. Traill, of Rolfsea, Orkney	1854
Burnley, W. F., Edinburgh	1838
Bursby, George G., Kirkhouse, Traquair	1859
500 Burt, Dr John, Edinburgh	1831
Burton, John, Rosewell Mains, Lasswade	1857
Buttar, David, Corston, Coupar-Angus	1861
Butter, Archibald, of Faskally, Pitlochry	1825
Buttery, A. W., Glasgow	1844

Crawford and Balcarres, The Right Hon. James, Earl of	1847
† Caithness, The Right Hon. James, Earl of	1845
Cawdor, The Right Hon. John, Earl	1839
Camperdown, The Right Hon. Adam, Earl of	1843
Colville (of Culross), The Right Hon. Charles, Lord	1851
510 Cathcart, Colonel The Hon. Frederick Macadam, of Craigengillan	1830
Carnegie, The Hon. Charles, M.P.	1856
Clerk, The Right Hon. Sir George, of Penicuik, Bart., Honorary Secretary of the Society	1812
Craig, The Right Hon. Sir William Gibson, of Riccarton, Bart., Treasurer of the Society	1824
Curriehill, The Hon. Lord	1822
Colquhoun, Sir James, of Luss, Bart.	1829
Campbell, Sir James, of Aberuchil, Bart.	1838
Carmichael, Sir William H. Gibson, of Castle-Craig and Skirling, Bart.	1856
Campbell, Sir Hugh Hume, of Marchmont, Bart.	1834
Cathcart, Sir John Andrew, of Carleton, Bart.	1834
520 Colebrooke, Sir Thomas Edward, of Crawford, Bart., M.P.	1838
Cumming, Sir Alexander Penrose Gordon, of Altyre and Gordonston, Bart.	1846
Campbell, Sir Archibald Islay, of Succoth, Bart.	1844

		Admitted
	CAMPBELL, Sir Alexander, of Barcaldine, Bart.	1845
	CAMPBELL, Sir James, of Stracathro, Glasgow	1838
	COCHRANE, Admiral Sir Thomas, G.C.B.	1817
	Cadell, Alex. Tod, R.A., Madras	1844
	Cadell, Henry, of Grange, Bo'ness	1856
	Cadell, Hew Francis, of Cockenzie, Prestonpans	1844
	Cairnie, C., of Blairhoyle, Thornhill, Stirling	1864
530	Caird, James, of Cassencarie, M.P., Creetown	1853
	Cairns, George, Edinburgh	1857
	Cairns, James, Dollar Bank, Dollar	1864
	Cairns, William, Ballinloan, Dunkeld	1861
	Calder, Francis, Yetholm Mains, Kelso	1853
	Calder, James, Colgrain, Cardross	1857
	Calder, Marcus, Shapinshay, Kirkwall	1846
	Calder, Robert, Kelloe Mains, Edrom	1857
	Calder, Robert, Whitehouse, Lumphanan	1858
	Calder, William, Cattle-Salesman, Edinburgh	1851
540	Calder, James H., Swinton Hill, Coldstream	1863
	Caldow, James, Maxwelltown, Dumfries	1860
	Caldwell, Frederick, of Missinish	1841
	Caldwell, William, Boydstone, Ardrossan	1862
	Callender, Henry, C.A., Edinburgh	1843
	Cameron Alexander, Invercomrie, Pitlochrie	1854
	Cameron, Alexander, Bogside, Cadder, Springburn	1857
	Cameron, Alexander, of Mainhouse, Elgin	1865
	Cameron, Donald, of Lochiel, Fort-William	1859
	Cameron, Donald Colin, Tallisker, Broadford	1861
550	Cameron, Hugh Innes, London	1835
	Cameron, James, Balnakyle, Munlochy	1857
	Cameron, John, Ballogoil, Dingwall	1864
	Cameron, Peter, Edinburgh	1850
	Cameron, William, Millhill, Auchterarder	1852
	Cameron, William, Factor, Lodge, Kingussie	1862
	Campbell, Alexander, of Auchindarroch, Lochgilphead	1837
	Campbell, Captain Alexander of Brackley, Nairn	1806
	Campbell, Alex. Cameron, of Monzie, Fort-William	1833
	Campbell, Alexander, Edinburgh	1835
560	Campbell, Alexander, Crosshill, Bishopbriggs	1857
	Campbell, Alex. Henry, of Little Grove, Herts	1863
	Campbell, Archibald, of Glendaruel	1826
	Campbell, Archibald, Camserney Cottage, Aberfeldy	1832
	Campbell, Archibald, of Blythswood, Renfrew	1848
	Campbell, Lt.-Col. Archd., yr. of Blythswood	1857
	Campbell, Archibald, yr. of Lerags, M.D.	1845

		Admitted
	Campbell, Archibald, Park, Aberdeen	1855
	Campbell, Arthur, of Catrine, W.S., Edinburgh	1816
	Campbell, Arthur, yr. of Catrine, W.S., Edinburgh	1854
570	Campbell, C. Macpherson, of Ballimore, Tighnabruaich	1864
	Campbell, Charles Vereker Hamilton, of Nether Place	1853
	Campbell, Colin, of Colgrain, Dumbarton	1847
	Campbell, Colin, of Caolis, Ballifetrich, Tyree	1858
	Campbell, Colin, of Ballinaby, Islay	1861
	Campbell, Colin G., of Stonefield, Tarbert	1838
	Campbell, Colin Yorke, of Barbreck, Captain R.N.	1858
	Campbell, David, Kirkforthar, Markinch	1854
	Campbell, Donald	1846
	Campbell, Donald, Reef Cottage, Tyree	1857
580	Campbell, Dugald M'Neill, of Kintarbet, Tarbert	1847
	Campbell, Duncan T., Duiletter, Dalmally	1858
	Campbell, Farquhar, of Aros, Tobermory	1839
	Campbell, George William, Mayfair, London	1863
	Campbell, George J., of Treesbanks, Kilmarnock	1835
	Campbell, Henry Fletcher, of Boquhan, Kippen	1823
	Campbell, Hugh, Surgeon, Glenralloch, Tarbert	1861
	Campbell, Ivie, Dalgig, New Cumnock	1856
	Campbell, James, London	1838
	Campbell, James, of Tillichewan, Dumbarton	1847
590	Campbell, James, Kilkea, Athy, Ireland	1850
	Campbell, James Archibald, of Inverawe	1833
	Campbell, James A., younger of Stracathro	1849
	Campbell, James G., Killyleoch, Dunscore, Dumfries	1860
	Campbell, John, Borland, Kenmore	1860
	Campbell, John, of Garrows, Amulree	1857
	Campbell, John of Possil, Torosay, Oban	1848
	Campbell, John of Strachur	1829
	Campbell, John, of Achalader, Blairgowrie	1846
	Campbell, Rev. John, Killin	1858
600	Campbell, John, Remnil, Campbeltown	1857
	Campbell, John, of Inverardoch, Doune	1857
	Campbell, John, of Ardfinaig, Ross of Mull, Aros	1857
	Campbell, John Archibald, W.S., Edinburgh	1813
	Campbell, John Deans, of Curreath, Troon	1835
	Campbell, John D., of Peaton, Clachan, Roseneath	1865
	Campbell, John Graham, of Shirvan, Lochgilphead	1863
	Campbell, Kenneth, of Ardew, Tobermory	1843
	Campbell, Major-General, C.B.	1857
	Campbell, Mungo, Glasgow	1824
610	Campbell, Neil Colquhoun, of Barnhill, Dumbarton	1863

		Admitted
	Campbell, Ord Graham, Edinburgh	1838
	Campbell, Richard D., of Jura	1836
	Campbell, Robert, of Sonachan, Inverary	1802
	Campbell, R. F. F., of Craigie, Ayr	1861
	Campbell, Rose	1809
	Campbell, Silvester, Kinnellar, Blackburn, Aberdeen	1858
	Campbell, Thomas, Hailes House, Edinburgh	1837
	Campbell, Thomas, Croftness, Aberfeldy	1860
	Campbell, Thomas. of Annfield, Irvine	1856
620	Campbell, Thomas Hinton, Old Nicolton, Doune	1864
	Campbell, T. W., of Walton Park, Dalbeattie	1856
	Campbell, Colonel Walter, N.B. Staff, Glasgow	1836
	Campbell, William, of Ormsary, Ardrishaig	1839
	Campbell, William of Dunmore, Tarbert	1854
	Campbell, William, Hamilton	1858
	Campbell, W., Cladwell, Islay	1861
	Cant, James, Orr Bridge, Kirkcaldy	1863
	Cantlie, William, Keithmore, Dufftown	1852
	Carfrae, Thomas, Land-Surveyor, Edinburgh	1850
630	Carlyle, Thomas Johnstone, of Waterbeck, Ecclefechan	1845
	Carmichael, Michael Thomson, of Eastend, Lanark	1825
	Carnegie, David, of Stronvar, Lochearnhead	1847
	Carnegie, George R., Edrom-Newton, Ayton	1854
	Carnegie, James, of Edrom-Newton, W.S., Edinburgh	1852
	Carnegie, John, of Redhall, Fordoun	1836
	Carnegie, William, of Eastertown, Dunlappie, Brechin	1856
	Carnegie, William, junior, Coul, Tannadyce	1858
	Carnegy, John,	1850
	Carphin, George, Banker, Dunkeld	1861
640	Carre, Walter Riddell, of Cavers Carre, Selkirk	1863
	Carruthers, David Alexander, Warmanbie, Annan	1826
	Carruthers, James, of Craig, Castle-Douglas	1860
	Carruthers, John, Kirkhill, Moffat	1854
	Carruthers, William Francis, of Dormont, Lockerbie	1848
	Carstairs, Drysdale, Merchant, Liverpool	1838
	Carstairs, John, Smeaton, Kirkaldy	1859
	Carter, Thomas, Allanton, Chirnside	1863
	Carter, Walter, Bank Agent, Ayton	1864
	Carver, John, Kinloch, Meigle	1861
650	Cassels, Alexander, W.S., Edinburgh	1848
	Cathcart, Elias, of Auchindrane, Ayr	1819
	Cathcart, R. of Pitcairlie, Auchtermuchty	1857
	Cay, John, Advocate, Sheriff of Linlithgowshire	1841
	Chalmer, Major, Larbert House, Stirling	1852

		Admitted
	Chalmers, Charles, of Monkshill, Aberdeen	1824
	Chalmers, John Inglis, of Aldbar, Brechin	1844
	Chalmers, Thomas, of Longcroft House, Linlithgow	1860
	Chalmers, William, Parkdargue, Forgue	1864
	Chambers, Robert, London	1841
660	Chambers, Robert, Junior, Edinburgh	1864
	Chancellor, John G., of Shieldhill, Biggar	1849
	Chandler, Henry, Salford	1857
	Charge, Thomas, of Barton, Richmond, York	1833
	Cheape, Lieut.-Col. Charles, of Killundine, Morven	1860
	Cheape, George C., of Strathtyrum, Strathmiglo	1864
	Cheyne, Henry, of Tangwick, W.S., Edinburgh	1838
	Cheyne, Mrs, of Lismore	1857
	Chiene, George Tod, C.A., Edinburgh	1838
	Chirnside, George, Newton House, Chathill	1860
670	Chisholm, The, Erchless Castle, Inverness	1865
	Chisholm, John, Charleston, Inverness	1854
	Chisholm, Lachlan, late of Lochans	1831
	Chisholm, William, Barnyards, Inverness	1856
	Chisholme, John Scott, of Stirches, Hawick	1839
	Chivas, Alexander, Banker, Aberdeen	1840
	Chrisp, Thomas, Hawkhill, Alnwick	1853
	Christie, Andrew, Adinston, Tranent	1850
	Christie, Charles J. Westbank Tranent	1850
	Christie, Charles J., Cairndinnes, Haddington	1862
680	Christie, Charles Maitland, of Durie, Leven	1841
	Christie, George, Junior, Shore Road, Stirling	1864
	Christie, Hugh, Glengolandie, Aberfeldy	1854
	Christie, Captain James, Hillend, Clackmannan	1835
	Christie, Jas. H. B. Stark, of Teasses, Largo	1863
	Christie, John	1846
	Christie, John, Land-Valuator, Perth	1861
	Christie, Peter, Mains of Scotscraig, Tayport	1861
	Christie, Robert, Accountant, Edinburgh	1824
	Christie, Thomas Craig, of Bedlay Moodiesburn	1857
690	Christison, R., M.D., Professor of Materia Medica, University of Edinburgh	1843
	Chrystal, John, Fence Houses, Durham	1854
	Chrystie, Captain Alexander	1834
	Chrystie, Captain Thomas, R.N., Edinburgh	1841
	Church, D. M., Ferniebank, Liberton	1855
	Church, James, Tower of Sark, Canonbie	1838
	Church, Miss Margaret, Park House, Canonbie	1860
	Clapperton, James, [illegible], Galashiels	1859

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		Admitted
	Clapperton, John, Newlands, Gifford	1855
	Clapperton, John, Home Lodge, Edinburgh	1864
700	Clapperton, Thomas, Edinburgh	1837
	Clark, Archibald, Inverchapple, Kilmun	1853
	Clark, Francis William, of Ulva, Aros	1838
	Clark, James, Wormiston, Crail	1842
	Clark, James, Ardtaraig, Dunoon	1853
	Clark, James, of Crossbasket, Glasgow	1857
	Clark, James, Oldhamstocks Mains, Cockburnspath	1864
	Clark, John, Plean, Stirling	1851
	Clark, John, Flender, Busby	1857
	Clark, John, Hillhead, Kingsbarns, Fife	1861
710	Clark, John Gilchrist, of Speddoch, Dabton, Thornhill	1858
	Clark, Maxwell, of Little Culmain, Dumfries	1862
	Clark, Samuel, Manswrae, Kilbarchan	1852
	Clark, William, Glentrain, Campbeltown	1857
	Clarke, Alexander, Eriboll, Lairg	1847
	Clarke, Augustus T., of Achareidh, Nairn	1865
	Clarke, George, Stronchrubie, Assynt	1855
	Clason, Rev. Patrick, D.D., Edinburgh	1838
	Clay, John, Winfield, Dunse	1854
	Clay, John, Kerchesters, Kelso	1854
720	Clay, Patrick, Berwick-on-Tweed	1854
	Clayhills, Alexander, of Invergowrie, Dundee	1838
	Clerk, Duncan, writer, Oban	1860
	Clerk, James, younger of Penicuik	1847
	Climie, William, Paisley	1857
	Clouston, Peter, Glasgow	1850
	Coats, Peter, of Woodside, Paisley	1862
	Coats, Thomas, of Ferguslie, Paisley	1852
	Cobb, William, Mains of Fintray, Dundee	1843
	Cochrane, Alexander, of Ashkirk, Hawick	1861
730	Cochrane, Alexander Baillie, of Lamington, M.P.	1842
	Cochrane, Henry, Broxburn Park, Broxburn	1854
	Cochrane, James, of Harburn, West Calder	1849
	Cochrane, James, Little Haddo, Foveran	1858
	Cochrane, William, Greenlaw Cottage, Roslin	1848
	Cockburn, George, Kilchiaron, Islay	1861
	Cockburn, Thomas, of Menslaws, Jedburgh	1851
	Cogan, Robert, Merchant, Glasgow	1830
	Cole, Captain William W., London	1848
	Colledge, William, Haggs Castle, Pollockshaws	1850
740	Collie, John, Ardgay, Elgin	1853
	Collier, John, Panlathie, Carnoustie	1843

	Admitted
Collyer, William D., of Cormiston, Biggar	1857
Colquhoun, A. Campbell, yr. of Killermont, Maryhill	1854
Colquhoun, John, Corkerhill, Pollockshaws	1850
Colquhoun, John Campbell, of Killermont, Maryhill	1824
Colvill, Robert	1858
Colvin, Andrew, Merchant, Wick	1861
Colvin, William, of Craigielands, Moffat	1860
Condie, George, Writer, Perth	1852
750 Condie, James, Blackfriar's House, Perth	1839
Connal, William, Glasgow	1850
Connell, James, of Conheath, Irvine House, Langholm	1843
Conning, John, Solicitor, Perth	1852
Constable, George, of Soylziary, Blairgowrie	1852
Constable, James C., of Callie, Blairgowrie	1854
Constable, James, Seaside, Errol	1860
Constable, Rev. John, Principal of the Royal Agricultural College, Cirencester	1864
Cook, Alexander Shank, Advocate, Sheriff of Ross-shire	1859
Cook, Charles, Aboyne Arms Inn, Aboyne	1858
760 Cook, John, W.S., Edinburgh	1841
Cooper, Alexander, Writer, Elgin	1865
Cooper, Henry R., of Ballindalloch, Balfron	1845
Cooper, James, Hillbrae, Bourtie, Keith Hall	1858
Cooper, William, of Failford, Tarbolton	1845
Copland, Robert, Mill of Ardlethen, Ellon	1855
Copland, John, Mainshead, Maxwelltown	1864
Copland, Walter, Thirlestane, Selkirk	1863
Cordiner, William F., Fraserford, Dunscore	1840
Corrie, Adam, South Park, Borgue, Kirkcudbright	1860
770 Cossar, Robert, Chesterhall, Dunbar	1859
Coteswortb, Robert, of Cowdenknowes, Melrose	1864
Coubrough, Archibald, Biggarshields, Biggar	1857
Coubrough, James, Blairtummoch, Campsie	1852
Coupar, John, Balrownie, Brechin	1859
Cousin, George, Sunnyside, Edinburgh	1865
Cousland, James, Banker, Denny	1864
Coutts, William, Sandlaw, Banff	1858
Coventry, Andrew, of Pittilloch, Edinburgh	1844
Coventry, George Andrew, yr. of Shanwell	1852
780 Coventry, William, Pleasance, Aberdour	1864
Cowan, Andrew, Spittalhill, Fintry	1857
Cowan, Charles, of Logan, Penicuik	1836
Cowan, Charles W., yr. of Logan, Penicuik	1860
Cowan, David, Edinburgh	1844

		Admitted
	Cowan, James, of Dildawn, LL.D., Castle-Douglas	1852
	Cowan, John, of Beeslack, Milton Bridge	1858
	Cowan, Peter, Lurg, Fintry	1857
	Cowan, Richard	1854
	Cowan, Robert, W.S., Edinburgh	1861
790	Cowan, Robert, Park, Paisley	1862
	Cowie, Alexander, Crombly Bank, Ellon	1853
	Cowie, David, Dysart, Montrose	1851
	Cowie, James, late Haulkerton Mains, Laurencekirk	1852
	Cowper, James, Achorachan, Ballindalloch	1860
	Craib, John, Strathmore, Tarland	1858
	Craig, David, Papermaker, Portobello	1855
	Craig, James, Caledonian Distillery, Edinburgh	1850
	Craig, James, of Craigdarroch, New Cumnock	1857
	Craig, James H. Gibson, yr. of Riccarton, Hermiston	1863
800	Craig, John, Guelt, Old Cumnock	1857
	Craig, John, Littlehill, Bishopbriggs	1857
	Craig, Joseph, of Threecrofts, Lochrutton	1860
	Craig, Robert, Buckley, Bishopbriggs	1857
	Craig, William, Writer, Dumfries	1859
	Craig, William C., Anneston, Biggar	1855
	Craig, William, Craig Villa, New Cumnock	1862
	Craigie, David, Banker, Perth	1842
	Craigie, James, Easter Tarsappie, Perth	1861
	Craigie, Lawrence, of Glendoick, Perth	1824
810	Craigie, William Roper, Toman Droighue, Aberfeldy	[illegible]
	Craike, Charles, Esbie, Lochmaben	1863
	Cranston, James, Pathhead, Cockburnspath	1857
	Cranstoun, George Cranstoun Trotter, of Dewar, Ayton	1849
	Cranstoun, William S., Dyke, Moffat	1859
	Craster, John, younger of Craster, Alnwick	1856
	Craufurd, Wm. Houison, of Craufurdland, Kilmarnock	1809
	Crawford, Adam, Edinburgh	1850
	Crawford, Alexander, Writer, Dunse	1853
	Crawford, Charles	1822
820	Crawford, Daniel, Barnbeath, Kilbarchan	1860
	Crawford, James Coutts, of Overton, Strathaven	1855
	Crawford, John, of Auchinames, West Kilbride	1818
	Crawford, John, The House of Tongue, Lairg	1854
	Crawford, John, Millstoneford, West Kilbride	1865
	Crawford, Peter, Drumjoyack, Strathblane	1857
	Crawford, William, late of Doonside, Ayr	1836
	Crawford, William, Balgarvie, Perth	1860
	Crawfurd, John	1819

		Admitted
	Crawfurd, W. S. Stirling, of Milton, Glasgow	1838
830	Crerar, John, Easter Drumatherty, Dunkeld	1861
	Creyk, Dr Alexander, Pitchaish, Ballindalloch	1850
	Crichton, Hew, Edinburgh	1838
	Crichton, Hew Hamilton, W.S , Edinburgh	1849
	Crichton, James Arthur, Advocate, Edinburgh	1847
	Crichton, John, of Linn, Dalry, Ayr	1849
	Crichton, William, Live Stock Agent, Haddington	1859
	Croall, John, Middlefield House, Edinburgh	1849
	Crombie, Alexander, of Thornton, Laurencekirk	1835
	Crombie, Alexander, yr. of Thornton, W.S., Edin.	1858
840	Crombie, John, Edinburgh	1861
	Cromarty, Wm., St Margaret's Hope, Orkney	1857
	Cross, David, Seed-Merchant, Glasgow	1845
	Cross, Robert, Hiltown, Liberton	1852
	Cruickshank, Amos, Sittyton, Aberdeen	1858
	Cruickshank, Anthony, Aberdeen	1847
	Cruickshank, George, Comisty, Huntly	1852
	Cruickshank, John, Barmuckitry, Elgin	1854
	Cruikshank, John, Cloves, Elgin	1852
	Cruickshank, John B., Newton, Kinloss, Forres	1858
850	Cruickshank, William, Milton of Petty, Ardersier	1865
	Crum, Walter, of Thornliebank, Glasgow	1844
	Cumming, James, Dourie Bank, Port-William	1841
	Cumming, Robt. Crawford, of Barremman, Roseneath	1857
	Cuninghame, Alexander, of Craigends, Johnstone	1844
	Cuninghame, David, Chapelton, Ardrossan	1850
	Cunliff, Richard Stedman, Glasgow	1857
	Cunningham, Alexander, of Balgownie, Culross	1841
	Cunningham, Alexander, Morebattle Tofts, Kelso	1841
	Cunningham, Alexander G., Rosebank, Currie	1854
860	Cunningham, Andrew, Carlogie House, Carnoustie	1861
	Cunningham, Charles R., Grahamslaw, Kelso	1863
	Cunningham, James, Tarbreoch, Dalbeattie	1864
	Cunningham, James C., Edinburgh	1864
	Cunningham, John Sinclair, Seed-Merchant, Edin.	1852
	Cunningham, John, Whitecairn, Dalbeattie	1857
	Cunningham, John M., Solicitor, Stirling	1864
	Cunningham, Thomas, Dallachy, Aberdour	1851
	Cunningham, Thomas, Kirkettle, Roslin	1857
	Cunningham, William A., of Logan, Cumnock	1836
870	Cunningham, Wm., Hole, Lennoxtown	1857
	Cunningham, W. C. S., of Caprington, Kilmarnock	1859

		Admitted
	Currie, Alexander, Advocate, P.C.S., Edinburgh	1836
	Currie, Andrew, Merchant, Kirkcaldy	1859
	Currie, James, Halkerston, Gorebridge	1853
	Currie, William, of Linthill, Lilliesleaf	1863
	Curror, Adam, Myreside, Edinburgh	1849
	Curror, John, Comiston, Colinton	1848
	Curror, Robert, Stirling	1859
	Cuthbertson, Archibald, Greendykes, Tranent	1822
880	Cuthbertson, William, Merchant, Glasgow	1836

	†Dalkeith, The Right Hon. William, Earl of, M.P.	1853
	Dalhousie, The Right Hon. Fox, Earl of, K.T.	1831
	Dunmore, The Right Hon. Charles, Earl of	1862
	Dudley, The Right Hon. William, Earl of	1843
	Dupplin, The Right Hon. George, Viscount	1853
	Dunfermline, The Right Hon. Ralph, Lord, K.C.B.	1859
	Dunglass, The Right Hon. Charles, Lord	1860
	Drummond, The Hon. Francis, Delvine, Dunkeld	1861
	Deas, The Hon. Lord	1838
890	Dunbar, Sir William, of Mochrum, Bart., M.P.	1845
	Dalrymple, Sir Hew, of North Berwick, Bart.	1841
	Dunbar, Sir Archibald, of Northfield, Bart.	1839
	Dunbar, Sir George, of Hempriggs, Bart.	1839
	Douglas, Sir George H. S., of Springwood Park, Bart.	1851
	Dundas, Sir David, of Dunira, Bart.	1828
	Drummond, Sir James Walker, of Hawthornden, Bart.	1834
	Davie, Sir Henry R. Ferguson, of Creedy, Bart., M.P.	1848
	Dale, John R., Auldhame, North Berwick	1851
	Dalgairns, Lieut.-Col., Balgersho, Coupar-Angus	1841
900	Dalgleish, Archibald, Glenmore, Oban	1854
	Dalgleish, James Ogilvie, of Woodburne, Ceres	1857
	Dalgleish, James, of Ardnamurchan, Edinburgh	1857
	Dalgleish, John J., yr. of Ardnamurchan, Edinburgh	1857
	Dalgleish, Laurence, Ardnamurchan, Mull	1858
	Dalgleish, Robert Bayne, of Dura, Cupar-Fife	1848
	Dalglish, Robert, of Kilmardinny, M.P., Glasgow	1857
	Dalmahoy, Patrick, of Bowerhouse, W.S., Edinburgh	1862
	Dalrymple, Charles, of Hailes, Musselburgh	1862
	Da'rymple, James, of Woodhead, Kirkintilloch	1857

		Admitted
910	Dalrymple, James, of Langlee, Galashiels	1859
	Dalzell, Allen, M.D., Edinburgh	1857
	Dalzell, James Allen, North Berwick	1835
	Dalziel, Alexander, Glenwharrie, Sanquhar	1860
	Dalziel, George, Merkland, Thornhill	1860
	Darling, Adam, Berwick,	1857
	Darling, James Stormonth, of Lednathie, Kelso	1863
	Darling, James Stormonth, junior, W.S., Edinburgh	1863
	Darling, James, Westhall, Innerwick	1860
	Darling, Thomas, Mordington Mains, Berwick	1863
920	Darling, William, Linplum, Haddington	1839
	Davidson, Adam, Nairn	1855
	Davidson, Alex., Mains of Cairnbrogie, Old Meldrum,	1855
	Davidson, Duncan, of Tulloch, Dingwall	1824
	Davidson, Duncan H.C.R., yr. of Tulloch, Dingwall	1864
	Davidson, George, Dean Park, Balerno	1847
	Davidson, George, Cairnfechle, Udny	1858
	Davidson, George, Walton, Linlithgow	1860
	Davidson, Henry, of Muirhouse, Edinburgh	1848
	Davidson, Henry M., Sheriff-Clerk of Haddingtonshire	1841
930	Davidson, Hugh, The Customs, Wick	1839
	Davidson, John, Brathins, Banchory	1857
	Davidson, John, Land Steward, Crathes, Aberdeen	1864
	Davidson, Lawrence, W.S., Edinburgh	1829
	Davidson, Patrick, of Inchmarlo, Aberdeen	1834
	Davidson, Robert, Banker, Inverness	1865
	Davidson, William, Oldhall, Thurso	1833
	Davidson, William James, of Ruchill, Glasgow	1850
	Dawson, John, Swinton Bridge End, Coldstream	1859
	Dawson, Rev. Thos. H., Monymusk	1858
940	Dawson, William, Mannerston, Linlithgow	1857
	Dawson, William, Warriston, Currie	1864
	Dean, John, Mains of Balquhain, Keith Hall	1856
	Deans, Henry, East Fenton, Drem	1850
	Deans, James Young, of Kirkstyle, Kilmarnock	1857
	Deans, John, Hedderwick, Dunbar	1841
	Deans, Peter D., Edinburgh,	1850
	Dempster, George, of Skibo, Dornoch	1823
	Dempster, George H., of Dunnichen, Forfar	1857
	Denholm, Alexander, Baitlaws, Biggar	1854
950	Denholm, David, Cauldcoats, Liberton	1854
	Dennistoun, Alexander, junior, Golfhill, Glasgow	1850
	Dennistoun, John, Glasgow	1838

		Admitted
	Dennistoun, Richard, Liverpool	1855
	Denoon, David, Merchant, London	1839
	Dewar, Lt.-Colonel Alexander Cumming,	1832
	Dewar, Andrew, Arnprior, Kippen, Stirling	1864
	Dewar, Daniel, Portbane Cottage, Kenmore	1860
	Dewar, Gilbert Innes, Edinburgh	1860
	Dewar, James, of Vogrie, Ford	1842
960	Dewar, John, Wine Merchant, Perth	1861
	Dewar, Peter, King's Park, Stirling	1864
	Dewhurst, George C., of Aberuchill, Comrie	1864
	Dick, Dr John, Broombank, Mid-Calder	1856
	Dick, John, junior, Writer, Stirling	1864
	Dick, William, Veterinary College, Edinburgh	1840
	Dick, William Douglas, of Montrave, Kennoway	1828
	Dickenson, William, Longcroft, Lauder	1859
	Dickie, John, Seedsman, Kilmarnock	1857
	Dickson, Alexander, Hermiston, Edinburgh	1848
970	Dickson, Archibald, Bughtrig, Coldstream	1854
	Dickson, Archibald, of Huntlaw	1823
	Dickson, George, of Huntlaw	1830
	Dickson, James, Dyemill, Moffat	1859
	Dickson, James Jobson, C.A., Edinburgh	1850
	Dickson, James Anderson, Banker, Arbroath	1858
	Dickson, John, Saughton Mains, Murrayfield	1844
	Dickson, John Heatly, Saughton Mains, Murrayfield	1862
	Dickson, John, W.S., Perth	1846
	Dickson, John F., Panbride House, Carnoustie	1858
980	Dickson, Peter, London	1858
	Dickson, Thomas, of Crochmore, Durrisdeer	1860
	Dingwall, Walter, New Register House, Edinburgh	1849
	Dingwall, William, Ramornie, Ladybank	1851
	Dinning, John, Belford	1863
	Dirom, Capt. Thos. Pasley, of Mount Annan, Annan	1860
	Dixon, Thomas G., Rhyl	1849
	Dobie, David, Tinwald Parks, Dumfries	1862
	Dodd, Nicholas, of Smalesmouth, Nisbet, Kelso	1863
	Dodd, James, Mossburnford, Jedburgh	1863
990	Dodd, William, Merchant, Glasgow	1837
	Doddrell, George J., Glasgow	1857
	Dodds, James, Factor, Leslie House, Markinch	1865
	Dodds, John, Cranston Riddell, Dalkeith	1844
	Dods, Alexander, Stonefieldhill, Lasswade	1859
	Dods, William, Seed Merchant, Haddington	1850

		Admitted
	Dods, William, Elwartlaw, Greenlaw	1863
	Don, Alexander, Keirsbeath, Crossgates	1858
	Donald, James, Waulkmill, Midmar	1858
	Donald, Robert, Largiebeg, Campbeltown	1857
1000	Donald William, Australia	1857
	Donaldson, James, of Keppoch, Cardross	1845
	Dougal, John, of Glenferness, Nairn	1844
	Dougall, Adam, Mouswald Banks, Dumfries	1865
	Dougall, Andrew, Railway Manager, Inverness	1865
	Dougall, Capt. Maitland, of Scotscraig, Tayport	1857
	Douglas, Adam Thomson, Moneylaw, Coldstream	1863
	Douglas, Alexander Forbes, Mount Teviot, Jedburgh	1854
	Douglas, Bentlem, Cairntows, Liberton	1858
	Douglas, Francis Brown, Advocate, Edinburgh	1839
1010	Douglas, George, Riddletonhill, Maxton	1861
	Douglas, James, Athelstaneford, Drem	1848
	Douglas, James, of Cavers, Hawick	1863
	Douglas, John, Tinnis, Selkirk	1862
	Douglas, Robert Johnstone, of Lockerbie	1842
	Douglas, Ronald, Conon, Dingwall	1864
	Douglas, Thomas, Clyth, Lybster	1861
	Douie, Andrew, Blair-Adam	1851
	Douie, John R. S., Factor, Polmaise, Stirling	1864
	Dove, John, Eccles Newtown, Coldstream	1853
1020	Dowell, Alexander, Edinburgh	1858
	Downie, Alexander, Merchant, Glasgow	1835
	Downie, John, Merchant, Glasgow	1838
	Drain, Daniel, Crossibeg, Campbeltown	1857
	Drennan, James, Holmston, Ayr	1857
	Drew, Laurence, Merryton, Hamilton	1850
	Drew, Peter, Carmyle, Tollcross, Glasgow	1854
	Drife, James, New Zealand	1857
	Drimmie, Daniel, Panmure Bleachfield, Dundee	1843
	Dron, William, Crieffvechter, Crieff	1861
1030	Drummond, George Home, yr. of Blair-Drummond	1835
	Drummond, Henry Home, of Blair-Drummond	1809
	Drummond, Henry, Seedsman, Stirling	1859
	Drummond. John, of Balquhandy, Dunning	1854
	Drummond, John Murray, of Megginch, Errol	1852
	Drummond, Thomas, of Newton	1828
	Drummond, William, Banker, Cupar-Fife	1837
	Drybrough, Thomas, Brewer, Edinburgh	1858
	Dryden, Wm., Land-Steward, Springwood Park, Kelso	1863

		Admitted
	Drysdale, Andrew, Myreton, Menstrie	1858
1040	Drysdale, Henry, Mains of Aberdalgie, Perth	1864
	Drysdale, William, yr. of Kilrie, Kinghorn	1861
	Dudgeon, James, Fodderty, Dingwall	1850
	Dudgeon, John, The Chalet, Lindfield, Sussex	1840
	Dudgeon, J. S., The Rocks, West Houthly, Sussex	1862
	Dudgeon, John, Almondhill, Kirkliston	1847
	Dudgeon, John B., Crakaig, Golspie	1856
	Dudgeon, Patrick, of Cargen, Dumfries	1851
	Dudgeon, Robert, Merchant, Liverpool	1828
	Dudgeon, Robert, Humbie, Winchburgh	1849
1050	Duff, Rev. David, D.D., Minister of Kenmore	1839
	Duff, James, Melgund, Aberlemno, Forfar	1865
	Duff, Lauchlan Duff Gordon, of Drummuir	1858
	Duff, Thomas, Perthshire Agric. Coy., Perth	1861
	Duff, Captain Wharton, of Orton, Fochabers	1864
	Duguid, Peter, of Cammachmore, Aberdeen	1858
	Dun, John, of Gilston, Galashiels	1863
	Dunbar, Lewis, Tullochgribon, Carr Bridge	1856
	Duncan, Alexander, of Providence, Rhode Island	1851
	Duncan, Alexander, Leuchars Castle, Leuchars	1857
1060	Duncan, Alexander, of Glencarron, Denny	1864
	Duncan, David H., Friock Mains, Arbroath	1858
	Duncan, George, Dundee	1843
	Duncan, George, Balchristie House, Largo	1838
	Duncan, James, Merchant, Leith	1826
	Duncan, John, Newseat of Tolquhon, Tarves	1855
	Duncan, John, Ardo, Methlic	1858
	Duncan, Robert, Kirkmay, Crail	1855
	Duncan, William, S.S.C., Edinburgh	1848
	Dundas, George, Advocate, Sheriff of Selkirkshire	1846
1070	Dundas, Joseph, of Carronhall, Falkirk	1862
	Dundas, Robert, of Arniston, Gorebridge	1847
	Dunlop, Alex. Murray, of Corsock, M.P., Edin.	1828
	Dunlop, Alexander, Glasgow	1857
	Dunlop, Archibald, London	1823
	Dunlop, George, Edinburgh	1849
	Dunlop, Henry, of Craigton, Glasgow	1838
	Dunlop, James, of Doonside, Largs	1844
	Dunlop, James, of Arthurlee, Barrhead	1844
	Dunlop, John, Duddingstone, Edinburgh	1836
1080	Dunlop, John, Whiteshawgate, Strathaven	1857
	Dunlop, John, Clermiston, Corstorphine	1859
	Dunlop, William H., of Annanhill, Kilmarnock	1853

		Admitted
	Dunn, Adam, Tranent Mains, Tranent	1854
	Dunn, Alexander, Wester Leochel, Craigievar	1858
	Dunn, David, Berryhill, Kelso	1863
	Dunn, John, Wester Innenteer, Craigievar	1858
	Dunn, William, Roxburgh Mains, Kelso	1853
	Durie, David, Nether Mill, Fettercairn	1858
	Durie, Robert Hogg, Standingstone, Haddington	1855
1090	Duthie, Alexander, Advocate, Aberdeen	1847
	Dykes, F. L. B., of Devonby Hall, Cumberland	1845
	Dyson, Thos. C., of Willowfield, Halifax, Yorkshire	1832

	Esterhazy, His Highness the Prince, Hungary, Honorary Associate	1836
	Errol, The Right Hon. William, Earl of	1854
	Eglinton and Winton, The Right Hon. Archibald, Earl of	1863
	Elcho, The Right Hon. Francis, Lord, M.P.	1847
	Elibank, The Right Hon. Alexander, Lord	1836
	Elphinstone, The Right Hon. William, Lord	1860
	Edmonstone, Sir Archibald, of Duntreath, Bart.	1821
1100	Elphinstone, Sir James Dalrymple Horn, of Horn and Logie-Elphinstone, Bart., M.P.	1840
	Erskine, Sir Thomas, of Cambo, Bart.	1860
	Easson, Robert, Errol Cottage, Errol	1860
	Eddison, Edwin, Headingly Hill, Leeds	1850
	Edgely, Thomas, Gilmerton, Edinburgh	1857
	Edington, Peter, Land Steward, Drummond Castle	1864
	Edmiston, Hugh Fleming, Yoker Mains, Glasgow	1863
	Edmond, John, Croftamie, Drymen	1857
	Edmonds, Leonard, London	1858
	Edward, Allan, Merchant, Dundee	1843
1110	Edwards, Matthew, Hilton, Alloa	1859
	Elder, George, of Knock Castle, Wemyss Bay	1863
	Elder, James, Whitehill Mains, Liberton	1854
	Elder, Thomas, Amisfield Mains, Haddington	1854
	Ellice, Edward, of Glenquoich, M.P.	1836
	Elliot, Adam, M.D., Goldielands, Hawick	1852
	Elliot, Henry, Junior, Greenriver, Hawick	1863
	Elliot, James, Lamberton, Berwick	1854
	Elliot, James, Galalaw, Kelso	1853
	Elliot, John, Primrosehill, Dunse	1854

		Admitted
1120	Elliot, John, of Binks, Burnmouth, Newcastleton	1863
	Elliot, John, The Flatt, Newcastleton	1863
	Elliot, Robert, Laighwood, Dunkeld	1848
	Elliot, Robert Kerr, of Clifton, Kelso	1849
	Elliot, Thomas, Hindhope, Jedburgh	1852
	Elliot, Thomas, Blackhall, Galashiels	1854
	Elliot, Walter, Hollybush, Galashiels	1860
	Elliot, Walter, of Wolfelee, Hawick	1861
	Elphinstone, Lietenant-Colonel John	1827
	Embleton, John, Broomhouse, Berwick-on-Tweed	1854
1130	Errington, Rowland, of Sandhoe, Northumberland	1841
	Erskine, Henry David, of Cardross, Stirling	1862
	Erskine, Vice-Admiral John, Cardross	1859
	Erskine, James, of Shielfield, Melrose	1849
	Erskine, Thomas, of Linlathen, Broughty Ferry	1843
	Erskine, Colonel, C B., Tillicoultry House, Tillicoultry	1863
	Euing, William, Glasgow	1857
	Ewen, Robert, Westown, Tarland	1858
	Ewing, Alexander, Glasgow	1844
	Ewing, Alex. Crum, yr. of Strathleven, Dumbarton	1857
1140	Ewing, Arch. Orr, of Ballikinrain, Killearn	1851
	Ewing, Humphrey Ewing Crum, of Strathleven, M.P.	1857
	Ewing, James Lindsay, of Caldercruix, Glasgow	1844
	Ewing, John Leckie, Merchant, Glasgow	1857
	Ewing, John Orr, of Ratho	1838
	Ewing, William Leckie, Ballincleroch, Lennoxtown	1835

	†Fife, The Right Hon James, Earl of, K.T.	1840
	Forbes, The Right Hon. Walter, Lord	1833
	Forbes, The Hon. Charles M. H., of Brux	1864
1150	Flahault, Charles, Count Mercer de	1821
	Forbes, Sir John Stuart, of Pitsligo, Bart.	1830
	Forbes, Sir William, of Craigievar, Bart.	1857
	Fergusson, Sir James, of Kilkerran, Bart. M.P.	1854
	Forbes, Sir Charles, of Newe and Edinglassie, Bart.	1828
	Fair, James S. Elliot, of Langlee, Jedburgh	1854
	Fair, John S. Elliot, Gilliestongues, Jedburgh	1863
	Fairholme, Geo. K. Erskine, of Old Melrose, Melrose	1864
	Fairholme, William, of Chapel-on-Leader, Lauder	1861
	Fairlie, James Ogilvie, of Coodham, Kilmarnock	1837

		Admitted
1160	Fairlie, James, Tanfield, Edinburgh	1865
	Fairrie, John, Merchant, London	1831
	Fairweather, Robert, Craigend, Brechin	1855
	Falconar, George, St Andrews	1835
	Falconar, John, Arnbarrow, Fettercairn	1858
	Falconer, Donald, Connonsyth, Arbroath	1858
	Falconer, Peter, Disblair, Summerhill, Aberdeen	1851
	Falconer, Thomas, Kinermony, Craigellachie	1865
	Falshaw, James, Civil Engineer, Edinburgh	1849
	Farie, James, of Farme, Glasgow	1850
1170	Farish, Samuel, Kirklands, Lockerbie	1860
	Farquhar, Arthur, of Elsick, W.S., Stonehaven	1852
	Farquharson, Francis, of Finzean, Edinburgh	1850
	Farquharson, Major-General Francis	1843
	Farquharson, Francis, Builder, Haddington	1856
	Farquharson, James, Auchinblae	1852
	Farquharson, Major John, of Corrachrie, Tarland	1841
	Farquharson, Robert O., of Haughton, Alford	1857
	Farrell, Alfred Herbert William	1858
	Farrell, Michael, of Woodburnden, Fordoun	1857
1180	Fell, William Edwin Cotton, Edinburgh	1854
	Fender, Robert, Rules Mains, Dunse	1863
	Fenton, John, Mill of Mains, Dundee	1843
	Fenwick, John, North House, Hawick	1862
	Ferguson, Vice-Admiral George, of Pitfour, Mintlaw	1828
	Ferguson, James D., Richmond, Yorkshire	1852
	Ferguson, John, of Knockindale	1824
	Ferguson, John, Burghlee, Loanhead	1863
	Ferguson, John, East Grange, Elgin	1855
	Ferguson, John, Brae of Coynach, Mintlaw	1860
1190	Ferguson, John, of Kilquhanity, Dalbeattie	1846
	Ferguson, Lieut.-Colonel Robert, of Raith	1845
	Ferguson, Thomas, Kinnochtry, Coupar-Angus	1858
	Ferguson, William, Auchenhard, West Calder	1864
	Fergusson, Muir, of Middlehaugh, Pitlochry	1842
	Fergusson, Samuel R., London	1836
	Fernie, John Carmichael, Easter Kellie, Pittenweem	1853
	Fettes, James, Surgeon, Laurencekirk	1850
	Field, The Rev. Edward Burch, of Moreland, Kinross	1864
	Field, James Hamilton, yr. of Moreland, Kinross	1864
1200	Findlay, Major, of Baturrich, Dumbarton	1857
	Findlay, Robert, Springhill, Baillieston, Glasgow	1855
	Findlay, Thomas Dunlop, Easterhill, Glasgow	1847
	Finlay, Alex. S., of Castle Toward, M.P., Dunoon	1844

		Admitted
	Finlay, John, New Farm, Lochgelly	1859
	Finlay, William, Brackenbrae, Bishopbriggs	1857
	Finlayson, James, Prora, Drem	1859
	Finlayson, John, Factor, Lochalsh	1859
	Finlayson, William, Harperstanes, Dumblane	1864
	Finnie, Archibald, Springhill, Kilmarnock	1865
1210	Finnie, James, of Newfield, Dundonald	1853
	Fisher, Daniel, S.S.C., Edinburgh	1819
	Fisher, Donald, Pitlochrie	1861
	Fisher, James, M.D.	1821
	Fleming, Alexander, Raith, Hamilton	1850
	Fleming, Alexander, Rousland, Linlithgow	1864
	Fleming, Andrew, Mains of Fullwood, Paisley	1852
	Fleming, James, Coats, Penicuik	1857
	Fleming, James, Holm, Stonehouse	1857
1220	Fleming, James, Three-Mile-Town, Linlithgow	1854
	Fleming, James, Kinneil Mills, Linlithgow	1864
	Fleming, J. N., Kilkerran, Maybole	1864
	Fleming, John, Ballindalloch	1857
	Fleming, John, Hawkwood, Strathaven	1857
	Flemyng, Robert Stewart	1826
	Fletcher, Angus, of Dunans, Edinburgh	1826
	Fletcher, Archibald, Tyndrum	1857
	Fletcher, Major C. E.	1848
	Fletcher, Don., of Bernice, Altamore, Tighnabruaich	1857
	Fletcher, Dugald, Ballachindrain, Cairndow	1853
1230	Fletcher, James, of Rosehaugh, Munlochy	1865
	Fletcher, John, yr. of Salton, Haddington	1857
	Flockhart, John, Charleton, Colinsburgh	1861
	Flockhart, William, Flockhouse, Blair Adam	1861
	Forbes, Arthur, of Culloden, Inverness	1850
	Forbes, Charles Henry, of Kingairloch, Bonaw	1836
	Forbes, Charles William	1856
	Forbes, Dugald, Writer, Glasgow	1847
	Forbes, George, Merchant, London	1830
	Forbes, George, Parkhead Villa, Perth	1835
1240	Forbes, James D., D.C.L., Principal of St Andrews	1836
	Forbes, James Stewart, Edinglassie, Strathdon	1830
	Forbes, James Ochoncar, of Corse, Whitehouse	1862
	Forbes, Major John, of Inverernan, C.B., Strathdon	1842
	Forbes, John, of Haddo, Forgue	1850
	Forbes, Patrick, of St Catherine's, Edinburgh	1834
	Forbes, William, of Medwyn, Edinburgh	1835
	Forbes, William, of Callendar, Falkirk	1860

		Admitted
	Forbes, William, Auchindinny, Milton Bridge	1863
	Ford, William, Hardengreen, Dalkeith	1849
1250	Forlong, William, of Erins, Tarbert	1838
	Forman, John Nairne, W.S., Edinburgh	1831
	Forman, John, Duncra Hill, Tranent	1863
	Forman, Robert, Keith House, Dalkeith	1852
	Forrest, David, of Treesbanks, Shotts	1857
	Forrest, James, junior, Kirriemuir	1843
	Forrest, Peter, Haggs, Ratho	1863
	Forrest, William, Allanton, Hamilton	1863
	Forrester, John, W.S., Edinburgh	1842
	Forrester, John, Nether Carse, Gargunnock	1864
1260	Forrester, William, Edinburgh	1851
	Forrester, William, Wedderburn Mains, Edrom	1854
	Forrester, W. A., of Barns, Peebles	1842
	Forsyth, David, Writer, Elgin	1865
	Forsyth, George, Ashybank, Hawick	1863
	Forsyth, John, Arabella, Parkhill, Tain	1855
	Fortune, George, Barnsmuir, Crail	1857
	Fortune, William R., of Muircambus, Colinsburgh	1854
	Foster, William, Engineer, Lincoln	1859
	Foulis, Robert, M.D., Cairnie Lodge, Cupar-Fife	1861
1270	Fowler, Andrew, Seed Merchant, Glasgow	1855
	Fowler, Henry Mackenzie, of Raddery, Fortrose	1846
	Fox, Michael, junior	1849
	Fox, Richard M., of Foxhall, Rathowen, Ireland	1838
	Foyer, David, Knowehead, Campsie	1857
	Fraser, Colonel Alexander, Royal Engineers	1818
	Fraser, Alexander, City Chamberlain, Aberdeen	1841
	Fraser, Alexander, Faillie, Inverness	1857
	Fraser, Andrew, W.S., Sheriff-Sub., Fort-William	1840
	Fraser, Archd. Thos. Fred., of Abertarff, Inverness	1820
1280	Fraser, Colonel Charles, of Castle Fraser, Cluny	1816
	Fraser, Evan Baillie, Inverness	1840
	Fraser, Hugh, Abersky, Inverness	1840
	Fraser, Hugh, Balloch of Culloden, Inverness	1858
	Fraser, Hugh, Calcutta	1856
	Fraser, John, London	1840
	Fraser, John, of Bunchrew, Inverness	1856
	Fraser, John, East Pinkerton, Dunbar	1860
	Fraser, Captain Jn., of Balnain, Farraline, Inverness	1865
	Fraser, Patrick Allan, of Hospitalfield, Arbroath	1854
1290	Fraser, Patrick, Sheriff of Renfrewshire	1863
	Fraser, Robert, Brackla, Nairn	1839

		Admitted
	Fraser, Sweton, Auchernack, Grantown	1854
	Fraser, Rear-Admiral Thomas, Portobello	1817
	Fraser, William, W.S., Edinburgh	1837
	Fraser, William Sutherland, Banker, Dornoch	1850
	Fraser, William, of Kilmuir, Skye	1852
	Fraser, William, Bone Mills, Broxburn	1857
	Fraser, William, Peel, Tibbermuir	1861
	Frazer, John, Overton, New Abbey, Dumfries	1858
1300	Frederick, David, Drumbreddon, Stranraer	1857
	Freeland, Robert, of Gryffe Castle, Bridge of Weir	1835
	French, James, Lampits, Carnwath	1855
	French, Dr James, C.B., Edinburgh	1853
	Frew, James, Balmalloch, Kilsyth	1858
	Friar, Thomas, of Grinden Ridge, Etal	1854
	Fullarton, Gavin, of Kerelaw, Stevenston	1844
	Fullerton, Captain James	1824
	Fullerton, William, Mains of Ardestie, Dundee	1852
	Fulton, Andrew, Saddler, Edinburgh	1857
1310	Fulton, William, Hatchetnize, Coldstream	1863
	Fyfe, John, of Dalmarnock, Glasgow	1847
	Fyfe, Robert, junior, Arbary, Kinross	1861
	†Galloway, The Right Hon. Randolph, Earl of	1830
	†Glasgow, The Right Hon. James, Earl of	1822
	Garlies, The Right Hon. Alan, Viscount	1860
	Gray, The Right Hon. John, Lord	1821
	Grant, The Hon. James, of Main, Elgin	1865
	Grierson, Sir Alex. William, of Rockhall, Bart.	1860
	Grant, Sir Archibald, of Monymusk, Bart.	1854
1320	Grant, Sir G. Macpherson, of Ballindalloch, Bart.	1859
	Gladstone, Sir Thomas, of Fasque, Bart.	1834
	Grant, Lieut.-Gen. Sir Patrick, G.C.B.	1862
	Gair, Hugh A., Hilton, Inverness	1864
	Gairdner, Charles Dalrymple, Auchans, Dundonald	1853
	Gairdner, Robert, Banker, Kilmarnock	1858
	Galbraith, Alexander, Croy, Cunningham, Killearn	1857
	Galbraith, Andrew, Merchant, Glasgow	1850
	Galbraith, David Stewart, late of Machrihanish	1812
	Galloch, John, Knockhill, Bridge of Allan	1864
1330	Galloway, David, Cairnie, Glencarse	1861
	Gamgee, John, New Veterinary College, Edinburgh	1859
	Garden, Archibald, Netherton, Forres	1859

		Admitted
	Garden, William, M.D., Balfluig, Aberdeen	1850
	Garden, William, Braco Park, Fraserburgh	1857
	Gardiner, George, Carrington Barns, Lasswade	1857
	Gardiner, James, Lanton, Mid-Calder	1855
	Gardiner, Robert, Lowbank, Auchterarder	1861
	Gardner, Hamilton Gray, W.S.	1844
	Gardner, James, Pharmaceutical Chemist, Edinburgh	1859
1340	Gardner, John	1844
	Gardner, Peter, Rotearns, Braco, Perthshire	1864
	Gardner, Robert, Traquair Knowe, Peebles	1855
	Gardner, Robert, City of Glasgow Bank, Whitburn	1855
	Gardyne, David, of Finhaven, Forfar	1842
	Garland, John, Cairnton, Laurencekirk	1849
	Garland, Thomas, junior, Ardlethen, Ellon	1851
	Gartshore, John Murray, of Gartshore, Kirkintilloch	1825
	Gartshore, John, Seedsman, Falkirk	1864
	Gatherer, George, Writer, Elgin	1854
1350	Gaukroger, George, Southfield, Longniddry	1859
	Gebbie, William, of Hazledean, Strathaven	1853
	Geddes, James, Orbliston, Fochabers	1843
	Geekie, Alexander, of Baldowrie, Coupar-Angus	1837
	Geekie, Peter, Balboughty, Perth	1837
	Geekie, Peter M., Cortachy, Kirriemuir	1861
	Geekie, Robert, of Rosemount, Blairgowrie	1843
	Geils, John Edward, of Dumbuck, Dumbarton	1844
	Gemmel, Thomas, Dalrioch, Campbeltown	1857
	Gentle, Robert, Dell, Inverness	1840
1360	Gerard, Archibald, of Rochsoles, Airdrie	1842
	Gibb, David, Bridge of Dye, Banchory-Ternan	1855
	Gibbon, Alexander, of Johnston, Laurencekirk	1834
	Gibbons, Edward, Portree, Skye	1830
	Gibbs, B. T. Brandreth, London	1849
	Gibson, Charles, Pitlochry	1861
	Gibson, James, Downieken, Dundee	1853
	Gibson, James, The Shaws, Selkirk	1863
	Gibson, James, Gunsgreen Hill, Eyemouth	1864
	Gibson, John, W.S., Edinburgh	1825
1370	Gibson, John, jun., W.S., Edinburgh	1828
	Gibson, John, Woolmet, Dalkeith	1847
	Gibson, John, Eastfield, Wiston, Biggar	1853
	Gibson, John, [illegible], Dumfries	1860
	Gibson, Robert, Windydoors, Stow	1859
	Gibson, Thomas, [illegible], Stow	1863
	Gibson, William W., [illegible] House, Edinburgh	1859

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		Admitted
	Gilbert, John Graham, of Yorkhill, Partick	1847
	Giles, James, of Kailzie, Peebles	1842
	Gilkison, Robert, jun., Glasgow	1848
1380	Gillanders, F. M., of Newmore, Invergordon	1844
	Gillanders, James F., of Highfield, Beauly	1854
	Gillespie, Alexander, Merchant, London	1836
	Gillespie, David, of Mountquhannie, Cupar-Fife	1841
	Gillespie, James, Craigie, Cramond	1849
	Gillespie, James, Annanbank, Lockerbie	1850
	Gillespie, James, Gateside, Douglas	1860
	Gillespie, John, W.S., Edinburgh	1846
	Gillespie, Robert, Merchant, London	1829
	Gillison, Thomas, Old Swan, Liverpool	1862
1390	Gillon, Andrew, of Wallhouse, Bathgate	1848
	Gilmour, Allan, of Eaglesham, Glasgow	1849
	Gilmour, John, of Mount Vernon, Row	1863
	Gilmour, Matthew, Town of Inchinnan, Renfrew	1857
	Gilmour, Walter James Little, of Craigmillar	1828
	Gilmour, William M., Shawburn, Hamilton	1863
	Girdwood, Robert, Tanfield, Edinburgh	1855
	Gladstone, Robertson, Merchant, Liverpool	1841
	Gladstone, Thomas Stewart, of Capenoch, Thornhill	1853
	Glasgow, Alexander, of Old Court, Cork	1847
1400	Glassford, James Glassford Gordon, of Dougalston	1861
	Glegg, John, Factor, Milliken House, Johnstone	1857
	Glen, John, Merchant, Edinburgh	1847
	Glen, Robert R., Banker, Linlithgow	1860
	Glen, Robert C., Auchenback, Barrhead	1865
	Glen, Thomas, Thornhill, Johnstone	1853
	Glendinning, George, Hatton Mains, Ratho	1849
	Glendinning, George, Rawfarm, Mid-Calder	1861
	Glendinning, Peter, Dalmeny Park, So. Queensferry	1848
	Glendinning, Robert W., Broomdykes, Ayton	1854
1410	Glennie, Arthur, Fernyflat, Bervie	1851
	Glover, Andrew, Lanrick Castle, Doune	1859
	Glover, Robert, Shandon, Drymen	1857
	Goldie, R. G. M., Springfield, Biggar	1865
	Goodlet, William, Bolshan, Arbroath	1851
	Goodsir, John, Professor of Anatomy, University of Edinburgh	1846
	Gordon, Adam Hay, of Avochie, Edinburgh	1846
	Gordon, Alexander, of Ellon	1808
	Gordon, Alexander, of Newton, Insch	1841
	Gordon, Arthur Forbes, of Rayne, Edinburgh	1850

		Admitted
1420	Gordon, Charles, of Auchleuchries, Peterhead	1832
	Gordon, Vice-Admiral Charles, Huntly	1835
	Gordon, Charles K. Johnstone, of Craig, K.L S.	1839
	Gordon, David A., of Culvennan, Castle-Douglas	1860
	Gordon, Edward Stratherne, Sheriff of Perthshire	1840
	Gordon, George, America	1829
	Gordon, George, Tullochallum, Craigellachie	1860
	Gordon, Harry George, of Killiechassie, Dunkeld	1855
	Gordon, Henry, Sheriff-Clerk, Dumfries	1860
	Gordon, James, of Ivy Bank, Nairn	1813
1430	Gordon, James, of Manar, Keithhall	1835
	Gordon, Captain James Alex., Ittingston, Huntly	1862
	Gordon, John, of Aikenhead, Cathcart	1838
	Gordon, John, Lettock, Glenlivet	1853
	Gordon, John, of Cluny, Aberdeenshire	1861
	Gordon, John, Uppertown of Towie, Mossat	1858
	Gordon, John Taylor, of Nethermuir, New Deer	1831
	Gordon, John Thomson, Sheriff of Edinburgh	1841
	Gordon, Peter Laing, of Craigmyle, Torphins	1834
	Gordon, Richard, of Halmyre, Leadburn	1845
1440	Gordon, Robert Macartney, of Rattra, Kirkcudbright	1846
	Gordon, R. H., Coul, Laggan	1863
	Gordon, Tho. Dempster, of Balmaghie, Castle-Douglas	1863
	Gordon, William, Aberdeen	1847
	Gordon, William Cosmo, of Fyvie, Aberdeen	1847
	Gorrie, John, Innerdunning, Dunning	1859
	Gorrie, Thomas, Wire-Manufacturer, Perth	1861
	Gourlay, Adam, Beaulyhill, Lilliesleaf	1863
	Gow, James, Bankend, Denny	1854
	Gow, John L., Raith, Kirkcaldy	1851
1450	Gowans, James, Rockville, Edinburgh	1860
	Græme, Robert, of Welhall, Hamilton	1853
	Graham, Alexander, of Capilly, Barrhead	1844
	Graham, Alexander	1854
	Graham, Carolus J. Home, Edinburgh	1862
	Graham, Captain G. W., of Meiklewood, Stirling	1864
	Graham, Frederick	1821
	Graham, George	1817
	Graham, Henry, Auckland, New Zealand	1855
	Graham, Humphrey, W.S., Edinburgh	1819
1460	Graham, James	1827
	Graham, James, of Fereneze, Barrhead	1843
	Graham, James Maxtone, of Redgorton, Stanley	1848
	Graham, James, Meikle Culloch, Dalbeattie	1851

		Admitted
	Graham, James, Braidlie, Canonbie	1862
	Graham, James, Southbar, Paisley	1863
	Graham, James, Myothill, Denny	1864
	Graham, John, Pearsie, Kingoldrum	1843
	Graham, John, of Shaw, Lockerbie	1852
	Graham, John Murray, of Murrayshall, Perth	1842
1470	Graham, Paul, of Drynie, Inverness	1865
	Graham, Robert, Hawick	1860
	Graham, Thomas, of Ballewan, M.D., F.R.S., Master of the Mint, London	1849
	Graham, William, Writer, Glasgow	1828
	Graham, Col. William, of Mossknow, Ecclefechan	1834
	Graham, William, jun., of Finnartmore, Kilmun	1844
	Graham, William, of Devonshaw, Dollar	1854
	Graham, William, jun., Lairg	1855
	Graham, William Stirling, of Airth, Falkirk	1833
	Grahame, Barron, of Morphie, Edinburgh	1853
1480	Granger, John, Perth	1861
	Grant, Charles, Hazelbrae, Glen Urquhart	1862
	Grant, Colin Campbell, W.S., Edinburgh	1859
	Grant, Duncan, of Bught, Inverness	1825
	Grant, Francis William, Monymusk, Aberdeen	1858
	Grant, Hay Macdowall, of Arndilly, Craigellachie	1852
	Grant, Rev. James, D.D., D.C.L., Chaplain to the Society	1828
	Grant, James Augustus, of Viewfield, Nairn	1840
	Grant, James Murray, of Glenmorriston, Inverness	1810
	Grant, James, Clashnior, Ballindalloch	1859
1490	Grant, John, of Kilgraston, Bridge of Earn	1819
	Grant, John, Hotel, Nairn	1857
	Grant, John, Burnside, Grandtully, Aberfeldy	1860
	Grant, John Peter, W.S., Edinburgh	1823
	Grant, Kenneth, Kinnellan, Dingwall	1853
	Grant, Patrick, W.S., Sheriff-Clerk, Inverness	1836
	Grant, Peter, Glassgreen, Elgin	1865
	Grant, Robert, of Kincorth, Forres	1826
	Grant, Robert, of Druminnor, Rhynie	1841
	Grant, Thomas Macpherson, of Craigo, Montrose	1846
1500	Grant, Walter Colquhoun	1844
	Grant, William, Spittal of Glenshee, Blairgowrie	1861
	Grant, William, Drumdelgie, Huntly	1862
	Grant, William, younger of Elchies, Craigellachie	1833
	Grant, William, Australia	1839
	Grant, W.P., of Rothiemurchus, Lynwilg	1821

		Admitted
	Grassick, Charles	1830
	Grassick, John, Houghton, Aberdeen	1829
	Gray, Alexander, Potholm, Langholm	1859
	Gray, Donald, Corrish, Golspie	1856
1510	Gray, George, Windyyett, Avonbridge, Falkirk	1857
	Gray, George, Whytemyres, Aberdeen	1858
	Gray, James, Bearside, Stirling	1851
	Gray, James, Braehead Mains, Cramond	1861
	Gray, James, West Plean, Bannockburn	1864
	Gray, John, Merchant, Helensburgh	1831
	Gray, John, Bonally Tower, Colinton	1848
	Gray, John, Uddingston, Glasgow	1856
	Gray, Patrick, Middle Strath, Falkirk	1854
	Gray, Thomas, Coul, Markinch	1854
1520	Gray, Thomas, Spean Lodge, Unachan	1858
	Gray, William, Kingston, Drem	1849
	Gray, William, Southfield, Duddingston, Edinburgh	1849
	Gray, William, Brownrigg, Drem	1855
	Green, William, Ruthrie, Craigellachie	1857
	Greenshields, John, of Kerse, Lesmahagow	1829
	Greg, John, Oatfield, Campbeltown	1850
	Gregorson, Angus, Banker, Oban	1851
	Gregory, Alex. Allan, Corn-Merchant, Inverness	1854
	Gregory, Arthur Thomas, of Buchromb, Mortlach	1833
1530	Greig, George, of Eccles, Coldstream	1863
	Greig, Thomas, of Glencarse, Perth	1852
	Greig, Thomas Watson, of Muirshiels, Paisley	1861
	Grey, George A., Millfield Hill, Wooler	1854
	Grierson, James, Caigton, Castle-Douglas	1851
	Grierson, James, of Dalgoner, Dunscore	1855
	Grierson, James, Morton Mains, Thornhill	1860
	Grierson, John, of Muirside, Holywood	1860
	Grierson, Joseph, Breoch, Castle-Douglas	1859
	Grierson, Robert, Westmains, Mouswald, Dumfries	1860
1540	Grierson, William, Torrs, Castle-Douglas	1859
	Grieve, John, Castles, Dalmally	1858
	Grieve, Michael, Kielater, Tyndrum	1859
	Grieve, Robert, Laudle, Strontian	1857
	Grieve, Robert, Mornish, Killin	1857
	Grieve, Walter, Whitehills, Muckhart	1861
	Grieve, William, Branxholm Park, Hawick	1834
	Grieve, William, Skelfhill, Hawick	1854
	Grigor, James D., Wester Alves, Forres	1858
	Grigor, John, Forres Nurseries, Forres	1847

	Admitted
1550 Grigor, William, of Seabank, Elgin	1865
Grindlay, Charles, Winchelhaugh, Stirling	1864
Guild, Andrew, Coulshill, Auchterarder	1861
Gulland, James, Tullygarth, Clackmannan	1851
Gulston, Allan James, Woodlands Castle, Swansea	1856
Gunn, Alexander, Dalemore, Thurso	1850
Gunn, Alexander, Dornoch	1856
Gunn, Donald, Brahan Cottage, Dingwall	1864
Gunn, James, Glendhu, Golspie	1839
Gunn, Marcus, Culgower, Golspie	1849
1560 Guthrie, David, Edinburgh	1850
Guthrie, David, Banker, Stranraer	1854
Guthrie, George, Rephad, Stranraer	1839
Guthrie, John, of Guthrie, Forfar	1836
Guthrie, Robert, Crossburn, Troon	1857
Gwynne, Alban Thos. Jones, of Monachty, Cardigan	1834
HAMILTON and BRANDON, His Grace William, Duke of	1865
†HOME, The Right Hon. Cospatrick, Earl of	1843
†HADDINGTON, The Right Hon. George, Earl of	1841
HOPETOUN, The Right Hon. John, Earl of	1853
1570 HERRIES, The Right Hon. William, Lord	1830
HALLIBURTON, The Right Hon. Lord John	1844
†HAMILTON, The Right Hon. R. C. Nisbet	1825
HOPE, Sir Archibald, of Pinkie, Bart.	1832
HAY, Sir Adam, of Smithfield and Hayston, Bart.	1825
HAY, Sir John C. Dalrymple, of Park Place, Bart., M.P.	1848
HALL, Sir James, of Dunglass, Bart.	1849
HEPBURN, Sir Thomas Buchan, of Smeaton, Bart.	1837
Hadden, Alexander, Aberdeen	1840
Hadden, George, Coburty, Fraserburgh	1858
1580 Haddon, Alexander, Honeyborn, Hawick	1857
Hadwen, Sidney, Kildonan Lodge, Golspie	1854
Hagart, Colonel, Edinburgh	1862
Hagart, Thomas, of Bantaskine, Falkirk	1826
Haggart, James V., of Glendelvine, Edinburgh	1844
Haig, Andrew, Meikle Kilmory, Rothesay	1855
Haig, J. A., Stage Hall, Stow	1855
Haig, John, Cameron House, Windygates	1841
Haig, William, Kincaple, Cupar-Fife	1857
Hain, David, Balgorno, St Andrews	1861

		Admitted
1590	Haldane, Robert, Fernielee, Galashiels	1859
	Halkett, James, Auchentender, Forgue	1864
	Halkett, John Craigie, yr. of Cramond	1864
	Hall, Alexander, Straiton, Leuchars, Fife	1861
	Hall, Andrew, Braerich, Golspie	1855
	Hall, Henry, Coul, Dornoch	1846
	Hall, John, Scribercross, Golspie	1841
	Hall, Colonel Thomas, of Killean, Tayinloan	1853
	Halley, Andrew, Millhole, The Cairnies, Perth	1861
	Hamilton, Daniel, Berthie Park, Perth	1861
1600	Hamilton, Hugh, of Pinmore, Girvan	1853
	Hamilton, James, Wallace Bank, Kilmarnock	1865
	Hamilton, John, of Fairholm, Larkhall	1827
	Hamilton, John, of Sundrum, Coylton	1839
	Hamilton, John, of Greenbank, Newton Mearns	1846
	Hamilton, John, Longrig, Torthorwald	1860
	Hamilton, John, Monktonhill Farm, Ayr	1864
	Hamilton, John Buchanan, of Leny, Callander	1846
	Hamilton, John G. Carter, of Dalzell, Hamilton	1857
	Hamilton, John G., Hafton House, Dunoon	1858
1610	Hamilton, J. B., Burnhouse, Carnwath	1865
	Hamilton, Lt.-Col. Ferrier, of Cairnhill, Kilmarnock	1827
	Hamilton, Robert, W.S.	1842
	Hamilton, Walter Ferrier, yr. of Cairnhill, M.P.	1848
	Hamilton, William, Merchant, Glasgow	1823
	Hamilton, William, of Minard, Inverary	1858
	Hamilton, William, Overton, Wishaw	1864
	Hamilton, William C., of Craighlaw, Wigtown	1852
	Hamilton, Wm. F., Callendar, Falkirk	1859
	Hamilton, Rev. Z. M., D.D., Bressay, Shetland	1864
1620	Handyside, David, Crosshall, Coldstream	1863
	Handyside, William, of Cornhill, Biggar	1843
	Hanning, John, Boghead, Mouswald	1861
	Hannam, John, Kirk Deighton, Wetherby	1854
	Hannay, John, Corskie, Banff	1858
	Harden, Robert Allan, Edinburgh	1833
	Hardie, George, Australia	1851
	Hardie, Robert, Harrietfield, Kelso	1851
	Hardie, Thomas, Hill of Kinnaird, Falkirk	1858
	Hardie, William, Borrowstoun Mains, Bo'ness	1863
1630	Hare, Steuart Bayley, of Calderhall, Mid-Calder	1849
	Harkness, W. M. J., Granton, Moffat	1864
	Harley, Alexander, Beckanham	1860
	Harland, Wm. Chas., of Suttonhall, York	1852

		Admitted
	Harper, Frank, Dingwall	1853
	Harper, Robert, Edmonston Mains, Liberton	1857
	Harris, Richard H., Carnhill, Forres	1864
	Harris, Thomas, Dalmarnoch, Dunkeld	1857
	Harrison, George, Edinburgh	1864
	Harrop, Isaac Worthington, New Zealand	1846
1640	Harvey, Arthur, Port Natal	1838
	Harvey, C. W., Merchant, Liverpool	1846
	Harvey, George, Whittingham Mains, Prestonkirk	1850
	Harvey, James, Pottertown, Belhelvie	1858
	Harvey, James H., Pitgersie, Foveran, Ellon	1854
	Harvey, John, of Tiningly Park, Yorkshire	1809
	Harvey, John Inglis, of Kinnettles, Forfar	1845
	Harvey, Robert, Distiller, Port-Dundas	1838
	Harvey, William James, of Carnousie, Turriff	1851
	Harvey, Rev. William, of Brownlee, Carluke	1852
1650	Hathorn, John Fletcher, of Castlewigg, Whithorn	1860
	Hay, Alexander, Trochelhill, Fochabers	1864
	Hay, Alexander, Salesman, Perth	1861
	Hay, Colonel A. S., Leith, of Rannes, C.B.	1862
	Hay, Colin, Callumkill, Port-Ellon, Islay	1865
	Hay, Col. Drummond, of Seggieden, Perth	1862
	Hay, George William, of Whiterigg, Sudbury	1841
	Hay, Captain James George, of Belton, Dunbar	1862
	Hay, James, Scrabster, Thurso	1862
	Hay, James, Merchant, Leith	1828
1660	Hay, James, jun., Little Ythsie, Tarves	1858
	Hay, James, Nether Mill of Tillyhilt, Tarves	1855
	Hay, John, of Letham Grange, Arbroath	1834
	Hay, John, Thirlstane Castle, Lauder	1859
	Hay, Robert, Reclerich, Ballindalloch	1852
	Hay, Samuel, Manager, Union Bank of Scotland	1846
	Hay, William, of Dunse Castle	1819
	Hay, William, of Hopes, Gifford	1835
	Hay, William, of Chapel, Drem	1853
	Hebden, Robert James, of Eday, Kirkwall	1857
1670	Hector, David, Sheriff of Wigtown, and Kirkcudbright	1863
	Hector, Robert, Montrose	1848
	Heddle, J. G., of Melsetter, Kirkwall	1863
	Heggie, Walter, Kirkcaldy	1859
	Henderson, Alexander, Longniddry	1837
	Henderson, Alexander, of Stemster, Thurso	1847
	Henderson, Charles, Abbotrule, Bonchester Bridge	1854
	Henderson, Charles J., Corn Merchant, Leith	1847

		Admitted
	Henderson, David, of Abbotrule, Bonchester Bridge	1854
	Henderson, David, of Gattaway, Newburgh	1850
1680	Henderson, Duncan, M.D.	1825
	Henderson, George, East Gordon, Kelso	1854
	Henderson, George, Garroch, Troqueer, Dumfries	1860
	Henderson, G. D. Clayhills, Hallyards, Perthshire	1843
	Henderson, James, Islay	1851
	Henderson, James, Netherraw, Lilliesleaf	1863
	Henderson, James, Kelloside, Sanquhar	1860
	Henderson, John, of Park, Glasgow	1838
	Henderson, John, W.S., Banker, Thurso	1839
	Henderson, John, Byres, Haddington	1850
1690	Henderson, John, Middlethird, Kelso	1854
	Henderson, John, Humbie Mains, Blackshiels	1859
	Henderson, Peter, Paisley	1859
	Henderson, Robert, Lawrencehill, Alloa	1858
	Henderson, Thomas, Chesterton, Dalkeith	1854
	Henderson, Thomas, Shidlaw, Coldstream	1863
	Henderson, William, Craigairnhall, Bridge of Allan	1851
	Henderson, William, Milton, Coupar-Angus	1861
	Hendrie, John, Kirkwood Colliery, Coatbridge	1862
	Hepburn, James, Preston Mains, Prestonkirk	1863
1700	Hepburn, John, Keithfield, Tarves	1858
	Hepburn, John Buchan	1845
	Hepburn, John Stewart, of Colquhalzie, Auterarder	1810
	Hepburn, William Rickart, of Rickarton, Stonehaven	1859
	Heriot, F. L. Maitland, of Ramornie, Sheriff of Forfar	1851
	Herriot, James, Leetside, Whitsome, Coldstream	1863
	Herris, William Young, of Spottes, Edinburgh	1823
	Herries, Alex. Young, yr. of Spottes, Edinburgh	1853
	Hewat, Richard, Writer, Castle-Douglas	1857
	Hewetson, James, Auchenbenzie, Thornhill	1862
1710	Hewetson, Robert, Auchenbenzie, Thornhill	1834
	Higgins, Robert, Ninewar, Prestonkirk	1863
	Hill, Alex., of Stonywynd, Boarhills, St Andrews	1861
	Hill, George Gosset, Merchant, London	1823
	Hill, James Lawson, W.S., Edinburgh	1847
	Hill, John, Easter Carlowrie, Cramond	1850
	Hill, Lawrence, Writer, Glasgow	1838
	Hill, Robert, Golspie Tower Farm, Golspie	1851
	Hill, Robert, W.S., Edinburgh	1865
	Hilson, George, jun., Jedburgh	1863
1720	Hilton, Henry, of Fairgirth, Dalbeattie	1860
	Hislop, Robert, jun., Prestonpans	1854

		Admitted
	Hobkirk, James, Craiglockhart, Slateford	1862
	Hobbs, Wm. Fisher, of Boxted Lodge, Colchester	1848
	Hodgson, Richard, of Carham, M.P., Coldstream	1850
	Hog, Thomas A., of Newliston, Kirkliston	1860
	Hogarth, George, Banker, Cupar-Fife	1842
	Hogarth, George, Eccles Tofts, Greenlaw	1863
	Hogg, Henry, Symington Mains, Stow	1863
	Hogg, Robert, Rosemay, Penicuik	1859
1730	Hogg, Thomas, Hillhouse, Coldstream	1854
	Hogg, Thomas, Cakemuir, Ford	1858
	Home, David Milne, of Wedderburn, Coldstream	1835
	Home, Francis, Sheriff-Substitute, Linlithgow	1829
	Home, G. H. M. Binning, of Argaty, Doune	1831
	Home, Lieut.-Col. Geo. Logan, of Broomhouse, Dunse	1852
	Honeyman, John, Ballamoar, Patrick, Isle of Man	1857
	Hood, Archibald, Coal Manager, Whitehill, Lasswade	1858
	Hood, Charles, Inverbrora, Golspie	1856
	Hood, James, Newmains, Prestonkirk	1857
1740	Hood, John, of Stoneridge, Coldstream	1827
	Hood, John, Townhead, Cockburnspath	1859
	Hood, John, Linross, Kirriemuir	1861
	Hood, Thomas, Coldstream Mains, Coldstream	1854
	Hope, Andrew, Edinburgh	1851
	Hope, George, Fenton Barns, Drem	1848
	Hope, James, Duddingston, Edinburgh	1847
	Hope, James, of Belmont, W.S., Edinburgh	1848
	Hope, John, Carbrook Mains, Stirling	1857
	Hope, John Henry, South Elphinstone, Tranent	1851
1750	Hope, William, Edinburgh	1859
	Horn, James, of Pitmedden, Aberdeen	1860
	Horn, John, of Thomanean, Kinross	1847
	Horn, Robert, Advocate, Edinburgh	1851
	Horn, Robert, Burnfoot, Perth	1861
	Horncastle, Henry, Edwinstowe, Otterton, Notts	1864
	Horne, Donald, W.S., Edinburgh	1817
	Horne, Major James, of Stirkoke, Wick	1846
	Horne, Thomas Elliot Ogilvie, W.S., Edinburgh	1851
	Hornsby, Richard, Grantham	1858
1760	Horrocks, John	1818
	Horsburgh, Robert, House of Tongue	1841
	Horsburgh, Major William Henry	1824
	Hosack, William, Lochnell, Bonaw	1853
	Hotchkis, James, Ladyland, Dumfries	1838
	Houldsworth, Henry, of Coltness, Wishaw	1857

		Admitted
	Houldsworth, Henry, junior, Glasgow	1865
	Houldsworth, John, Craigforth, Stirling	1865
	Houldsworth, Joseph Henry, Glasgow	1857
	Houldsworth, Thomas, of Farnsfield, Notts	1865
1770	Houldsworth, William, Glasgow	1857
	Houston, John, Geilston, Cardross	1857
	Houston, Colonel A., of Clerkington, Haddington	1845
	Houston, William, Kintradwell, Golspie	1854
	Howard, James (J. and F. Howard), Bedford	1859
	Howatson, Charles, of Dornal, Muirkirk	1865
	Howden, Francis, Falkland	1842
	Howden, James, Jeweller, Edinburgh	1827
	Howden, John, Seedsman, Inverness	1865
	Howden, John, Overseer, Braco Castle, Perthshire	1864
1780	Howden, Robert, Boggs, Pencaitland	1850
	Howe, Alexander, W.S., Edinburgh	1854
	Howie, Henry Brown, Detchant, Belford	1863
	Howie, James, Howtle, Coldstream	1863
	Howie, John, Muirhouse, Kilmarnock	1857
	Hoyes, James, Lochinvar, Elgin	1854
	Hoyle, Duncan, London	1855
	Hozier, James, of Mauldslie Castle, Carluke	1822
	Hozier, William Wallace, St Enoch's, Glasgow	1862
	Hubback, Joseph, Liverpool	1853
1790	Hubback, Thomas, Sunlawshill, Kelso	1851
	Huggins, W. B., Glasgow	1844
	Hughan, Peter, Cults, Garlieston	1860
	Hughan, Thomas, of Airds	1838
	Huie, James, Durry, Campbeltown	1857
	Hume, M. N. Macdonald, W.S., Edinburgh	1818
	Hume, P. Hallyburton, Lawfield, Cockburnspath	1840
	Hume, Thomas, Portobello	1854
	Hunt, James Alex., of Pittencrieff, Dunfermine	1849
	Hunt, James, of Navity, W.S., Edinburgh	1859
1800	Hunt, Thomas, Thornington, Coldstream	1863
	Hunter, Alexander, St Colmac, Rothesay	1855
	Hunter, Alexander, Nethershiel, Ratho	1855
	Hunter, David, of Blackness, Dundee	1826
	Hunter, Evan Allan, W.S., Edinburgh	1860
	Hunter, George M., Cuthlie, Arbroath	1861
	Hunter, Herbert, of Burnhead, Lockerbie	1861
	Hunter, James	1823
	Hunter, Lt.-Colonel James, of Auchterarder	1823
	Hunter, James, of Auldhouseburn, Motherwell	1852

		Admitted
1810	Hunter, James William, of Thurston, Dunbar	1842
	Hunter, John, Oxenford Mains, Ormiston	1842
	Hunter, John, New Banchory, Bonchory	1857
	Hunter, John, Dipple, Fochabers	1864
	Hunter, Matthew D., of Antonshill, Coldstream	1863
	Hunter, Philip, Edinburgh	1856
	Hunter, Richard, Edinburgh	1837
	Hunter, Robert, Sheriff of Bute and Dumbarton	1843
	Hunter, Robert, Dalhousie Chesters, Lasswade	1854
	Hunter, Robert, Edinburgh	1862
1820	Hunter, William G., Dumfedling, Langholm	1860
	Hunter, William, Haugh, Kirkliston	1853
	Hunter, William King, Banker, Dunse	1854
	Hunter, William, Mackribeg, Campbeltown	1857
	Husband, Robert, Gellet, Dunfermline	1859
	Hutchinson, James, Merchant, Glasgow	1838
	Hutchinson, William, of Ruthven, Coldstream	1863
	Hutchison, James, Townhead, Mouswald, Dumfries	1857
	Hutchison, John	1841
	Hutchison, Robert, of Cairngall, Longside	1829
1830	Hutchison, Robert, Kirkcaldy	1850
	Hutchison, Robert, of Carlowrie, Kirkliston	1858
	Hutton, Thomas, St Cyrus, Montrose	1844
	Hyndman, Henry C., of Springside, West Kilbride	1859
	Hyslop, Hamilton D. B., Tower, Sanquhar	1857

	Inglis, The Right Hon. John, Lord Justice-Clerk	1852
	Innes, Sir James Milne, of Edingight, Bart.	1838
	Imrie, William, Perth	1861
	Inch, John, West Mains, Liberton	1855
	Inch, John, Edinburgh	1864
1840	Inglis, Charles Craigie Halkett, of Cramond	1834
	Inglis, George, Dron, Cupar-Fife	1864
	Inglis, Harry Maxwell, of Logan Bank, P.C.S.	1847
	Inglis, Henry, of Torsonce, W.S., Edinburgh	1849
	Inglis, Lieut.-Col. Hugh, of Kingsmills, Inverness	1856
	Inglis, John, Steam Mills, Musselburgh	1860
	Inglis, John, of Redhall, Slateford	1857
	Inglis, John, Spittalton, Gargunnock	1864
	Inglis, Peter, East Pilton, Edinburgh	1865
	Inglis, William, Rosebery, Gorebridge	1858

		Admitted
1850	Inkson, Patrick, Berryleys, Keith	1857
	Innes, Alexander, of Raemoir, Banchory	1840
	Innes, Alexander Mitchell, of Ayton	1842
	Innes, Cosmo, P.C.S., Edinburgh	1840
	Innes, George Mitchell, of Bangour	1847
	Innes, John B., W.S., Edinburgh	1847
	Innes, Thomas, of Learney, Torphins	1846
	Innes, Thomas Mitchell, of Phantassie, Prestonkirk	1842
	Innes, Thomas G. Rose, of Netherdale, Turriff	1862
	Ironside, John, Brindy, Whitehouse, Aberdeen	1858
1860	Ironside, William, Clofrickford, Ellon	1859
	Irvine, Alexander Forbes, of Drum, Aberdeen	1845
	Irvine, Rev. A. Robertson, D.D., Blair-Atholl	1838
	Irvine, John, Carco, Kirkconnel, Sanquhar	1860
	Irvine, William Stewart, M.D., Pitlochrie	1843
	Irving, George Vere, of Newton, Abington	1844
	Irving, John, London	1838
	Irving, William, Barndennoch, Auldgirth, Dumfries	1857
	Ivory, James, Edinburgh	1833

	Jerviswoode, The Hon. Lord	1831
1870	Johnstone, The Hon. Henry Butler, of Corehead	1842
	Jardine, Sir William, of Applegarth, Bart.	1823
	Johnstone, Admiral Sir Wm. J. Hope, K.C.B.	1859
	Johnston, Sir William, of Kirkhill, Edinburgh	1848
	Jack, John S., Carrat, Stirling	1864
	Jack, Michael, Peggy's Mill, Cramond Bridge	1863
	Jack, Samuel, Dreghorn Mains, Colinton	1860
	Jack, Robert, West Craigs, Corstorphine	1854
	Jack, Robert, factor, Dalziel, Motherwell	1855
	Jackson, Edward, Edinburgh	1863
1880	Jackson, John, of Amisfield, Dumfries	1859
	Jackson, John, Bush, Langholm	1859
	Jaffray, John, Bank Agent, Dunbar	1858
	Jameson, Melville, Solicitor, Perth	1852
	Jamieson, David, Mains of Auchmithie, Arbroath	1858
	Jamieson, George Auldjo, C.A., Edinburgh	1860
	Jamieson, James Fife, Glasgow	1857
	Jamieson, John, of Kingask, St Andrews	1860
	Jamieson, Richard, Holm, Carsphairn	1861
	Jamieson, William, Noblehill, Dumfries	1860

		Admitted
1890	Jamieson, William H., Straiton, Liberton	1859
	Jamieson, Wm. Alex., Colliston Mains, Arbroath	1858
	Jardine, Andrew, of Lanrick, Doune	1846
	Jardine, Alexander, yr. of Applegarth, Lockerbie	1850
	Jardine, James, of Larriston, Dryfeholm, Lockerbie	1846
	Jardine, John, of Thorlieshope, New Castleton	1854
	Jardine, Robert, of Balgray, Lockerbie	1860
	Jardine, Robert, of Castlemilk, Lockerby	1863
	Jeffrey, John, Glasgow	1857
	Jeffrey, John, of Balsusney, Kirkcaldy	1859
1900	Jeffray, A. G., Ballindalloch Mills, Balfron	1864
	Jeffray, William Allan, Braehead, Dalswinton	1862
	Jobson, William, Turvelaws, Wooler	1855
	Johnson, George, Springfield, Forres	1857
	Johnston, Alexander, Hailes, Slateford	1852
	Johnston, George, Marlefield, Kelso	1853
	Johnston, Henry, Bath	1863
	Johnston, James, Capplegill, Moffat	1854
	Johnston, James, Letham Mains, Haddington	1856
	Johnston, James, Huntington, Lauder	1857
1910	Johnston, John	1833
	Johnston, John, jun., Ballencrieff Mains, Bathgate	1856
	Johnston, John, Mill of Hirn, Banchory	1857
	Johnston, John S., Crailinghall, Jedburgh	1853
	Johnston, Robert, Merchant, Aberdeen	1839
	Johnston, Lieut.-Gen., of Carnsalloch, Dumfries	1860
	Johnston, William, of Lathrisk, Falkland	1849
	Johnston, William, Writer, Bathgate	1852
	Johnston, William, Ranachan, Campbeltown	1857
	Johnstone, Alexander, W.S.	1819
1920	Johnstone, Charles, Mingary, Strontian	1857
	Johnstone, Christopher, Glasgow	1850
	Johnstone, George, M.D., Fincraigs, Cupar	1857
	Johnstone, James, Banker, Dumfries	1860
	Johnstone, James, of Alva, Stirling	1828
	Johnstone, James Bell, Holestane, Thornhill	1860
	Johnstone, John A., Archbank, Moffat	1859
	Johnstone, John James Hope, of Annandale, M.P.	1824
	Johnstone, Miss Hope, of Annandale	1865
	Johnstone, Robert, Polmoodie, Moffat	1859
1930	Johnstone, Thomas, Lochhouse, Moffat	1859
	Johnstone, Walter, Archbank, Moffat	1859
	Jolly, David Leitch, Banker, Perth	1829
	Jones, Charles Digby	1862

		Admitted
	Jopp, Alexander, Advocate, Aberdeen	1834
	Jopp, Robert, New Zealand	1858
	Joss, John, Budgate, Cawdor, Nairn	1865
	†KINNOULL, The Right Hon. Thomas, Earl of	1806
	KINTORE, The Right Hon. Francis, Earl of	1850
	†KINNAIRD, The Right Hon. George, Lord, K.T.	1830
1940	KINNAIRD, The Hon. Arthur, M.P.	1862
	KENNEDY, The Right Hon. T. F., of Dunure	1812
	KINLOCH, The Hon. Lord	1844
	KINLOCH, Sir David, of Gilmerton, Bart.	1828
	Kay, Charles, Earnside, Forres	1858
	Kay, James, Hillhead, Gargunnock	1864
	Kay, John, Softlaw, Kelso	1863
	Kay, William, Viewbank, Lasswade	1863
	Kaye, Robert, of Millbrae, Moodiesburn	1844
	Keir, Andrew T.	1844
1950	Keir, Duncan, Bucklyvie	1864
	Keir, Patrick Small, of Kinmonth, Kirkmichael	1837
	Keir, Simon, Burnside, Elgin	1857
	Keir, William, of Whitehaugh, Newcastleton,	1859
	Keith, Peter, Factor, Barrogill Castle, Thurso	1865
	Kemp, James, Balnaglack, Petty, Inverness	1857
	Kemp, John, Implement Maker, Stirling	1852
	Kemp, Robert, Grain-Merchant, Aberdeen	1858
	Kennedy, Donald, Monteagle, Tain	1838
	Kennedy, David, Newlands, Kirkmahoe	1863
1960	Kennedy, Capt. Hew F., of Bennane, Girvan	1832
	Kennedy, James, Brandleys, Sanquhar	1859
	Kennedy, James, New Zealand	1850
	Kennedy, John, of Kirkland, Tynron, Dumfries	1839
	Kennedy, John Lawson, of Knocknaling, Dalry	1846
	Kennedy, Robert, Ballechin, Dunkeld	1861
	Kennedy, T., Nursery and Seedsman, Dumfries	1845
	Kennedy, William, Glasgow	1842
	Kennedy, William, W.S., Edinburgh	1862
	Kennoway, Robert, Burnhead, Lasswade	1860
1970	Ker, E. Martin, of Gateshaw, Morebattle, Kelso	1863
	Ker, Robert, of Auchinraith, Hamilton	1854
	Kerr, Abram, Castlehill, Thornhill	1864
	Kerr, Alexander, of Scroggiehill, Castle-Douglas	1858
	Kerr, Christopher, of Arthurstone, Dundee	1843
	Kerr, Christopher Webster, The Cottage, Dundee	1859
	Kerr, John, Land-Surveyor, Dunse	1853

		Admitted
	Kerr, John, Morton, Mid-Calder	1859
	Kerr, John, Brocklehirst, Mouswald, Dumfries	1860
	Kerr, Robert, of Chapeldonan, Edinburgh	1857
1980	Kerr, Thomas, Whitehill, Sanquhar	1860
	Kerr, William Williamson	1845
	Kerr, William, Wester Causewayend, Mid-Calder	1854
	Kerr, William Scott, of Chatto, Sunlaws, Kelso	1833
	Kidd, Alexander F., National Bank, Burntisland	1865
	Kidd, James, Grange of Barry, Carnoustie	1858
	Kidd, John, Midscryne, Carnoustie	1858
	Kidston, Archibald G., Glasgow	1844
	Kidston, John P., of Cairns, Cambuslang	1850
	Kier, Thomas, Newlands, Falkirk	1864
1990	Kilgour, Robert, jun.	1826
	Kilpatrick, Peter, The Cairnies, Perth	1862
	King, David, Roseneath	1864
	King, James, yr. of Campsie, Levernholm, Hurlet	1857
	King, Jas. Foster, of Carnegie Park, Glasgow	1850
	King, John, Braco, Airdrie	1857
	King, John H., of the Lodge, Balerno	1860
	King, William, Manufacturer, Glasgow	1839
	Kininmonth, Peter, Perceval, Buckhaven	1859
	Kinloch, Alexander, yr. of Gilmerton, Drem	1859
2000	Kinloch, Alexander John, of Park, Aberdeen	1841
	Kinloch, George, of Kinloch, Meigle	1825
	Kinloch, Colonel John, of Kilrie, Kirriemuir	1829
	Kinnear, Charles, of Kinloch, Ladybank	1824
	Kinross, John, Gunnochan, Braco, Perthshire	1864
	Kirk, John, W.S., Edinburgh	1848
	Kirk, James, Kaimknow, Muckart	1861
	Kirkaldy, George D. H., of Hearensbrook, Ireland	1844
	Kirkpatrick, Samuel, West Roucan, Torthorwald	1860
	Kirkwood, Hugh, Killermont, Maryhill, Glasgow	1854
2010	Kirkwood, John, Implement-Maker, Tranent	1854
	Kirkwood, Robert, Kilmaurs	1852
	Knight, Robert, Middleton, Fintray	1858
	Knowles, Thomas, Flesher, Aberdeen	1858
	Kyle, Colonel Alexander, of Binghill, Aberdeen	1835

LEINSTER, His Grace Augustus, Duke of, K.P., Honorary Member	1851
†LOTHIAN, The Most Noble William, Marquis of	1854
LAUDERDALE, The Right Hon. Thomas, Earl of	1863

		Admitted
	LOUGHBOROUGH, The Right Hon, Francis, Lord	1857
	†LOVAT, The Right Hon. Thomas, Lord	1820
2020	LESLIE, The Hon. George Waldegrave, M.P.	1862
	LOVAT, The Hon. Simon Fraser, Master of	1853
	LAUDER, Sir John Dick, of Fountainhall, Bart.	1848
	LOW, General Sir John of Clatto, K.C.B.	1861
	Laidley, J. W., of Seacliffe, North Berwick	1863
	Laing, George, Cornhill, Coldstream	1863
	Laing, John, Glendeuglie, Damhead, Kinross	1856
	Laing, Robert, Addinstone, Lauder	1850
	Laing, Thomas, Yorkston, Gorebridge	1855
	Laird, David, Belmont Castle, Meigle	1833
2030	Laird, George W., Denfield, Arbroath	1858
	Lamont, James, of Knockdow, Innellan	1850
	L'Amy, John R., of Dunkenny, Forfar	1854
	Landale, Andrew, Easthall, Cupar-Fife	1855
	Landale, Andrew, Balmbriech, Newburgh	1861
	Landale, James, Woodmill, Falkland	1857
	Landale, Thomas, Easter Rhynd, Perth	1855
	Lang, Hugh M., of Blackdales, Largs	1849
	Lang, John, Selkirk	1859
	Lang, John, Bield, Gargunnock	1864
2040	Lang, Robert, Torr Hall, Bridge of Weir	1857
	Lang, William, of Groatholm, Largs	1854
	Langlands, James C., Bewick, Alnwick	1854
	Latham, Patrick R., Aberchalder, Fort-Augustus	1857
	Latta, Mathew Rodger, Bankhead, Balerno	1864
	Lauder, Dewar, Kinkell, St Andrews	1859
	Lauder, John Thomson, Edinburgh	1860
	Laurence, George W., Largnean, Haugh of Urr	1860
	Laurie, James, Mitchelston, Stow	1859
	Laurie, John, of Maxwellton, Moniaive	1840
2050	Laurie, Wm. Kennedy, of Woodhall, Castle-Douglas	1848
	Law, Robert, Engineer, Shettleston, Glasgow	1838
	Lawrie, Archd. Campbell, of Moss, Killearn	1864
	Lawrie, William, Ferneyflat, Slateford	1850
	Lawson, Alexander, of Burnturk, Kettle	1853
	Lawson, Alexander, Merchant, Dundee	1843
	Lawson, Alexander, Old Mills, Elgin	1854
	Lawson, Charles, of Borthwick Hall, Lord Provost of Edinburgh	1830
	Lawson, Charles, yr. of Borthwick Hall, Edinburgh	1846
	Lawson, Henry Graham, Edinburgh	1859
2060	Lawson, Thomas, Longhurst Grange, Morpeth	1854

		Admitted
	Lawson, William, Lessendrum, Huntly	1853
	Leadbetter, John, Merchant, Glasgow	1838
	Learmonth, Alexander, North Bank, Bo'ness	1858
	Learmonth, Lieut.-Col. Alexander, of Dean	1860
	Learmonth, Thomas, Parkhill, Linlithgow	1824
	Lee, John, Oakwood, Selkirk	1863
	Lees, John, Marvingston, Haddington	1855
	Lees, Richard, Drinkstone, Hawick	1863
	Lees, Robert, of Fens, Leabrae, Galashiels	1861
2070	Leigh, Rev. Peter, Golborne Park, Lancashire	1823
	Leighton, James, Baldarroch, Banchory	1857
	Leishman, James, of Broomrig, Dollar	1864
	Leishman, Thomas, Meiklewood, Gargunnock	1864
	Leitch, Archd. K., Inchstelly, Forres	1858
	Leith, Alexander, of Freefield, Old Rayne	1841
	Lennie, John, Long Newton, Gifford	1857
	Leny, James Macalpine, of Dalswinton, Dumfries	1824
	Leslie, Colonel, of Balquhain, K.H. Keith Hall	1858
	Leslie, Charles S., yr. of Balquhain, Keith Hall	1858
2080	Leslie, George A. Young, of Kininvie, Mortlach	1840
	Leslie, James, Thorn, Blairgowrie	1857
	Leslie, James, Boghall, Linlithgow	1863
	Leslie, William, of Warthill, M.P.. Old Rayne	1848
	Lewis, James, Edinburgh	1863
	Liddell, James, Auchtertool House, Kirkcaldy	1843
	Lidderdale, Wm. H., Writer, Castle-Douglas	1864
	Ligertwood, John, Sheriff-Clerk of Aberdeenshire	1858
	Ligertwood, Lewis, Bracklay, Methlic	1858
	Lindsay, Alexander K., of Balmungo, St Andrews	1841
2090	Lindsay, Donald, C.A., Edinburgh	1843
	Lindsay, Ebenezer, Hartside, Lamington	1857
	Lindsay, James, Kilchinbuach, Campbeltown	1857
	Lindsay, James, East Newton, Arbroath	1858
	Lindsay, John Mackenzie, W.S., Edinburgh	1846
	Lindsay, Thomas, Hillhouse, Lamington	1857
	Lindsay, William, Provost of Leith,	1854
	Lindsay, William, Stanhope, Stobo, Peebles	1855
	Lithgow, Edward, Bedshiel, Greenlaw, Dunse	1863
	Lithgow, William, Stanmore House, Lanark	1857
2100	Little, John, Meikleholmside, Moffat	1859
	Livingstone, Tho. S. Fenton, of West Quarter, Polmont	1863
	Loch, George, London	1853
	Lochhead, Thomas, Gortanansaig, Innellan	1861
	Lockhart, Allan Eliott, of Borthwick Brae, Hawick	1832

		Admitted
	Lockhart, James Sinclair, of Castlehill	1846
	Lockhart, John, Stirling	1849
	Lockhart, Rev. Laurence, D.D., of Milton-Lockhart	1857
	Lockie, William, West Morriston, Earlston	1859
	Logan, Alexander, London	1831
2110	Logan, Andrew, Crossflat, Kilbarchan	1857
	Logan, David, Auchincraw, Ayton	1854
	Longmore, Andrew, Rettie, Banff	1852
	Longmore, John Alexander, W.S., Edinburgh	1837
	Longmore, William, Banker, Keith	1858
	Lorimer, George B., Kirkland, Sanquhar	1857
	Lorimer, John, Achrossan, Tigh-na-Bruaich	1865
	Lorimer, Thomas Webster, Belkie, Aberruthven	1843
	Lorimer, William, Rigg, Kirkconnell	1860
	Lovie, Alexander, Nether Boyndlie, Fraserburgh	1857
2120	Low, James, Berrywell, Dunse	1843
	Low, James, Yonderton, Ellon	1854
	Lowe, Robert, General Agent, Kirkside, Perth	1861
	Lowden, John M., of Cocklick, Clonyards, Dalbeattie	1858
	Lowis, John, of Plean, Stirling	1864
	Lowndes, James, of Arthurlee	1850
	Lucas, Robert, Cornton, Bridge of Allan	1864
	Luke, John, of Brownhills, Muircambus, Colinsburgh	1859
	Lumsdaine, Rev. Edwin Sandys, of Blanerne	1837
	Lumsdaine, Stamford R., of Lathallan, Colinsburgh	1862
2130	Lumsden, David, Pitcairnfield, Perth	1861
	Lumsden, George, Leslie Lodge, Keith Hall	1850
	Lumsden, George, Glasgow	1857
	Lumsden, James, Braco, Keith	1840
	Lumsden, James, Glasgow	1844
	Lumsden, John, Learmonth, Coldstream	1854
	Lumsden, Colonel Thomas, of Belhelvie, C.B.	1851
	Lumsden, William James, of Balmedie, Belhelvie	1841
	Lyall, Charles, Old Montrose, Montrose	1850
	Lyall, David, of Gallery, Montrose	1854
2140	Lyall, Robert, Merchant, Glasgow	1843
	Lyall, Robert, Carcary, Brechin	1850
	Lyall, Robert, Broombarns, Forgandenny	1861
	Lyell, John, M.D., Newburgh	1859
	Lyell, John, Banker, Newburgh	1861
	Lyell, Thomas, Shielhill, Kirriemuir	1836
	Lyon, George, of Glenogil, Finhaven	1809
	Lyon, James, Burnhaugh, Netherly, Stonehaven	1859

		Admitted
	*MONTROSE, His Grace James, Duke of, K.T.	1821
	MORTON, The Right Hon. Sholto, Earl of	1846
2150	MORAY, The Right Hon. John, Earl of	1824
	†MANSFIELD, The Right Hon. David, Earl of, K.T.	1833
	MINTO, The Right Hon. William, Earl of	1863
	MURRAY, The Right Hon. Lord James	1865
	MELVILLE, Lieut.-General, The Right Hon. Henry, Viscount, K.C.B.	1856
	MIDDLETON, The Right Hon. Henry, Lord	1865
	MACKENZIE, The Right Hon. Holt	1833
	M'NEILL, The Right Hon. Duncan, of Colonsay, Lord Justice-General	1833
	MONCRIEFF, The Right Hon. James, Lord Advocate	1848
	M'NEILL, The Right Hon. Sir John, G.C.B.	1846
2160	MAXWELL, The Hon. Marmduke C., of Terregles	1830
	MAXWELL, The Hon. Henry Constable, of Milnehead	1838
	MENZIES, The Hon. Lady, of Menzies	1839
	MURE, The Hon. Lord	1847
	MANSEL, Sir John, Bart.	1840
	MAXWELL, Sir W. A., of Calderwood, Bart.	1830
	MENZIES, Sir Robert, of Menzies, Bart.	1841
	MURRAY, Sir Patrick Keith, of Ochtertyre, Bart.	1862
	MACKENZIE, Sir William, of Coul, Bart.	1857
	MAXWELL, Sir William, of Monreith, Bart.	1840
2170	MAXWELL, Sir John, of Polloc, Bart.	1825
	MAXWELL, Sir John Heron, of Springkell, Bart.	1839
	MONCREIFFE, Sir Thomas, of Moncreiffe, Bart.	1843
	MACKENZIE, Sir Kenneth Smith, of Gairloch, Bart.	1854
	MACKENZIE, Sir Jas. J. Randoll, of Scatwell, Bart.	1838
	MACKENZIE, The Rt. Hon. Lady Anne, of Scatwell	1841
	MURRAY, Sir John Nesbitt, of Philiphaugh, Bart.	1846
	MONTGOMERY, Sir Graham G., of Stanhope, Bart., M.P.	1843
	MAXWELL, Sir William, of Cardoness, Bart.	1841
	MACKENZIE, Sir Alexander Muir, of Delvine, Bart.	1862
2180	MARJORIBANKS, Sir John, of Lees, Bart.	1854
	MAITLAND, Sir Alex. C. Gibson, of Cliftonhill, Bart.	1847
	MACKENZIE, Sir Evan, of Kilcoy, Bart.	1846
	MENTETH, Sir James Stuart, of Mansfield, Bart.	1857
	MACTAGGART, Sir John, of Ardwell, Bart.	1839
	MATHESON, Sir James, of Lews, Bart., M.P.	1843
	MACDONALD, Gen. Sir John, of Dalchosnie, K.C.B.	1819
	MACDOUGALL, Admiral Sir John, of Macdougall, K.C.B., Oban	1821
	Macadam, John, Blairover, Drymen	1857

		Admitted
	Macadam, Dr Stevenson, F.R.S,E., Edinburgh	1859
2190	M'Adam, William, Kepculloch, Balfron	1864
	Macalister, Alexander, of Loup and Torrisdale	1840
	Macalister, Keith, of Glenbarr, Tarbert	1842
	M'Alister, Robert, Mid Ascog, Rothesay	1855
	Macallan, James, W.S., Edinburgh	1823
	M'Arthur, John, Banker, Inverary	1862
	Macarthur, Major Alexander	1840
	Macarthur, Duncan, New Zealand	1842
	Macarthur, Dr Peter, Australia	1819
	M'Artney, James, Royal Hotel, Dollar	1857
2200	Macaskill, Donald, of Rhudunan, Broadford	1840
	Macaskill, Hugh, Rhudunan, Broadford	1830
	M'Auslin, J., Kilbridbeg, Cairndow	1853
	MacAndrew, D. M., Merchant, Leith	1854
	MacBey, Peter, Land-Surveyor, Woodside, Elgin	1854
	Macbean, David, of Delmany, Nairnside, Nairn	1865
	Macbraire, James, of Broadmeadows, Berwick	1863
	M'Call, Henry, younger of Daldowie, Glasgow	1846
	M'Call, James, of Daldowie, Glasgow	1844
	M'Call, Samuel, of Caitloch, Moniaive	1847
2210	M'Call, Thomas, Merchant, Glasgow	1838
	M'Callum, George Kellie, of Braco, Perthshire	1842
	M'Callum, John, Plewlands, Edinburgh	1843
	M'Callum, John, Hosh Distillery, Crieff	1861
	M'Callum, John, Fendoch, Crieff	1864
	M'Candlish, John M'Gregor, W.S., Edinburgh	1859
	M'Caw, Alexander, Ardlochan, Kirkoswald	1851
	M'Chlery, Henry, London	1857
	M'Clean, Alexander H., Auchneel, Stranraer	1851
	MacClelland, George, W.S.	1838
2220	M'Coll, Donald, Appin House, Appin	1843
	M'Combie, James Boyn, Advocate, Aberdeen	1840
	M'Combie, John, Kinaldie, Tarland	1858
	M'Combie, Peter, Farmtown of Linturk, Alford	1858
	M'Combie, Robert, Mains of Drumtochty, Auchinblae	1858
	M'Combie, William, of Easter Skene, Skene	1840
	M'Combie, William, Tillyfour, Aberdeen	1847
	M'Connachy, Archibald, Mackremore, Campbeltown	1857
	M'Connach, Charles, Hopewell, Tarland	1858
	M'Connach, Hugh, Crobhlaw, Alford, Aberdeen	1864
2230	M'Connel, John, Penrith	1842
	M'Cowan, Robert, Sec. Glasgow Agricul. Society	1856
	M'Craken, John, Drum, New Abbey, Dumfries	1850

		Admitted
	M'Crie, James, Broughton Mains, Garlieston	1860
	M'Creath, Thos., Grain-Merchant, Ayr	1863
	M'Culloch, Alexander, of Glen, Gatehouse of Fleet	1859
	M'Culloch, Walter, of Ardwall, Gatehouse of Fleet	1849
	M'Diarmid, Charles A., Acharn, Killin	1858
	M'Diarmid, D. A., Killiemore, Aros	1858
	Macdonald, Alexander, of Lochshiel, Strontian	1824
2240	Macdonald, Dr Alexander, Prince Edward's Island	1838
	Macdonald, Alexander, Inverness	1841
	Macdonald, Alexander, Balranald, Lochmaddy	1854
	Macdonald, Alexander, jun., Strathmashie, Kingussie	1857
	Macdonald, Alexander, Runnagour, Aberfoyle	1857
	Macdonald, Alexander S., Mudale, Lairg	1855
	Macdonald, Alister M'Ian, yr. of Dalchosnie, Pitlochry	1841
	Macdonald, Angus, Banker, Callander	1857
	Macdonald, Angus, of Glenaladale, Fort-William	1827
	Macdonald, Archibald Burns, of Glencoe, Perth	1855
2250	Macdonald, Archibald, Islay	1838
	Macdonald, Major Donald, of Ardmore	1822
	Macdonald, Captain Donald, of Isauld, Thurso	1817
	Macdonald, Donald, Bridge End, Dingwall	1850
	Macdonald, Donald, Weem Hotel, Aberfeldy	1860
	Macdonald, Duncan C.	1859
	Macdonald, Harry, Banker, Portree	1857
	Macdonald, Hugh P.	1830
	Macdonald, John, Procurator-Fiscal, Dunfermline	1836
	Macdonald, John, of Monachyle, Lochearnhead	1857
2260	Macdonald, John Robertson, Rodil, Harris	1841
	Macdonald, Peter, Brodick, Arran	1861
	Macdonald, Reginald George, of Clanranald	1807
	Macdonald, Roderick C., of Castle Teirim	1839
	Macdonald, Lt.-Col. William, of Powderhall, Edin.	1813
	Macdonald, Professor William, M.D., St Andrews	1818
	Macdonald, William, Glasgow	1844
	Macdonald, William, of Balnakilly, Blairgowrie	1861
	Macdonald, William S., Fairyknowe, Ecclefechan	1860
	Macdonald, William, writer, Elgin	1865
2270	Macdonald, Wm. Macdonald, of St Martin's, Perth	1844
	Macdonnell, Eneas Ronald, of Morar, Edinburgh	1846
	Macdouall, Colonel James, of Logan, Stronraer	1838
	M'Douall, James, yr. of Logan, Stranraer	1865
	M'Dougall, Thomas, Eskmills, Penicuik	1856
	Macdougal, Alexander, Granton Mains, Edinburgh	1847
	Macdougall, Allan, W.S.	1829

		Admitted
	M'Dougall, Arch., Miltown, Ardtalanaig, Kenmore	1860
	M'Dougall, Duncan D., Ardbeg, Islay	1862
	Macdougall, Colin, of Lunga	1808
2280	Macdougall, Captain James Patrick	1838
	Macdougall, John, Kerrytonlia, Rothesay	1853
	MacDougall, Patrick, of Gallanach, W.S., Edin.	1849
	M'Dowall, Major-Gen., of Garthland, Lochwinnoch	1846
	Macdowall, Henry, Carruith, Bridge of Weir	1845
	Macduff, Alexander, of Bonhard, Perth	1843
	M'Duff, James, Newmill, Stanley	1859
	Macewan, James, of Tar of Ruskie, Callander	1834
	M'Ewan, Alexander	1846
	M'Ewan, Andrew, South Glen, Dalbeattie	1858
2290	M'Ewan, John, Merchant, Glasgow	1850
	M'Ewen, John, Beannie, Braco, Perthshire	1864
	M'Ewen, John, Merchant, Stirling	1865
	MacEwen, Neil M., Blackdub, Stirling	1859
	M'Farlan, John, Faslane, Helensburgh	1851
	Macfarlan, William, of Bencloich	1832
	Macfarlane, Alex., Pollanilline, Campbeltown	1857
	Macfarlane, Donald, Auchray, Aberfoyle	1857
	Macfarlane, Donald, Balmuldy, Bishopbriggs	1860
	Macfarlane, Duncan, Torr, Row	1857
2300	Macfarlane, James, Shielhill, Stanley	1861
	Macfarlane, John, of Muckroy	1821
	Macfarlane, John, of Ballencleroch, Lennoxtown	1857
	Macfarlane, John, Greenfield, Helensburgh	1857
	Macfarlane, Thomas, Clachan, Cairndow	1829
	Macfie, Claud, of Gogarburn, Corstorphine	1862
	Macfie, John, Cressfield, Ecclefechan	1860
	Macfie, Robert, of Dreghorn, Liverpool	1864
	Macfie, Samuel, Cressfield, Ecclefechan	1860
	M'Gibbon, David, Inveravon, Polmont	1863
2310	M'Gibbon, David, Architect, Edinburgh	1863
	M'Gill, James, Torrorie, Kirkbean, Dumfries	1850
	M'Gill, James, Rotchell, Dumfries	1860
	M'Gill, John, Barsalloch, Wigtown	1850
	Macgregor, Alexander, London	1837
	M'Gregor, Alister, Innerladdren, Carr Bridge	1863
	Macgregor, Donald Robert, Merchant, Leith	1857
	Macgregor, James, Fort-William	1833
	Macgregor, John, late of Glengyle	1832
	M'Gregor, James, of Glengyle, Glasgow	1857

		Admitted
2320	M'Gregor, John, Bellridding, Dumfries	1859
	M'Gregor, John, Tynreich, Dunkeld	1861
	Macgregor, Ronald, W.S., Fort-William	1858
	M'Ilraith, James, of Auchenflower, Ballantrae	1835
	MacIndoe, Robert, Merkins, Kilmaronock, Dumbarton	1864
	M'Inroy, James Patrick, of Lude, Blair-Athole	1831
	M'Inroy, Lieut.-Colonel Wm., of The Burn, Brechin	1827
	M'Intosh, David, of Havering Park, Romford	1864
	Macintosh, Lieut.-General, of Campsie, K.H.	1852
	M'Innes, Duncan, of Cowden, Comrie	1865
2330	M'Intyre, Archibald, Arden, Airdrie	1855
	MacIntyre, Donald, Tenablair, Comrie	1861
	Macintyre, John, Cleugh Farm, Oban	1844
	M'Isaac, John, Corraphlin, Campbeltown	1857
	M'Iver, Evander, Scourie	1850
	Macivor, John, New South Wales	1827
	Mack, James, Upper-Keith, Blackshiels	1851
	Mack, William, of Berrybank, Reston	1854
	Mackay, Donald, Lythmore, Thurso	1852
	Mackay, George, of Bighouse	1846
2340	Mackay, John, Soccoth, Dalmally	1857
	Mackay, John Alexander, of Blackcastle, Edinburgh	1857
	Mackay, Thomas, Shiness, Lairg	1856
	M'Kean, Robert, Lumloch, Bishopriggs	1857
	M'Kechnie, Neil, Inverary	1855
	Mackechnie, James, Torren, Lochgilphead	1864
	Mackellar, Duncan	1839
	M'Kellar, Neill, Kilmartin, Lochgilphead	1862
	Mackenzie, Alex., Alanfearn, Culloden, Inverness	1853
	Mackenzie, Alexander, Edinburgh	1846
2350	Mackenzie, Captain Boyce, Creech, Bonar	1855
	Mackenzie, Daniel, jun., Merchant, Glasgow	1844
	Mackenzie, Donald, Sheriff of Fifeshire	1848
	Mackenzie, Donald, Balnabeen, Dingwall	1855
	Mackenzie, Donald, Balguie, Applecross	1858
	Mackenzie, George, Dingwall	1830
	Mackenzie, George A., Merchant, Liverpool	1862
	Mackenzie, Hugh, of Dundonnell, Ullapool	1860
	Mackenzie, James, W.S., Edinburgh	1845
	Mackenzie, James Fowler, of Allangrange, Munlochy	1865
2360	Mackenzie, John, of Glack, Old Meldrum	1835
	Mackenzie, John, Edinburgh	1848
	Mackenzie, John, Barnhill, Dumfries	1850

		Admitted
	Mackenzie, John Monro, Wishaw	1853
	Mackenzie, John Ord, of Dolphinton, W.S., Edinburgh	1848
	Mackenzie, John Whitefoord, W.S., Edinburgh	1821
	Mackenzie, John, jun., W.S., Edinburgh	1863
	Mackenzie, John, Duchlage, Craigrownie, Roseneath	1865
	Mackenzie, Keith William Stewart, of Seaforth	1846
	Mackenzie, Kenneth, C.A., Auditor of Accounts to the Society	1848
2370	Mackenzie, Kenneth Francis	1811
	Mackenzie, Kenneth John, Advocate	1845
	Mackenzie, Murdo, Easter Moy, Beauly	1853
	Mackenzie, Robert D., of Caldarvan, Alexandria	1838
	Mackenzie, Roderick, Glack, Aberdeen	1856
	Mackenzie, Thomas, of Ord, Beauly	1846
	Mackenzie, Thomas, Edinburgh	1851
	Mackenzie, Dr William, of Culbo, Edinburgh	1810
	Mackenzie, Wm., Carron, Ballindalloch	1857
	Mackenzie, Wm., Unthank, Inchture	1852
2380	Mackenzie, William, Ardross, Dingwall	1862
	M'Kerchar, James, Dalchiarlich, Fortingall	1860
	M'Kerral, Archd., Brunerican, Campbeltown	1857
	Mackerrow, Andrew, Beansburn, Kilmarnock	1862
	M'Kessack, John, Balnaferry, Forres	1857
	M'Kessack, Robert, of Waterford, Forres	1864
	Mackie, George, of Dunjarg, Castle-Douglas	1860
	Mackie, Ivie, of Auchencairn, Castle-Douglas	1862
	Mackie, James, of Bargaly, M.P., Castle-Douglas	1845
	Mackie, James Logan, Lagavulin, Islay	1864
2390	Mackie, John, Sarkshields, Kirkpatrick-Fleming	1860
	Mackie, John, Oldtown of Coynach, Mintlaw	1853
	Mackie, John Wyse, Edinburgh	1852
	Mackie, Robert, Factor, Loudon, Galston	1857
	Mackinlay, David, Oswald Bank, Partick	1844
	Mackinlay, David, of Newlandburn, Edinburgh	1848
	Mackinlay, James, Glasgow	1854
	Macinklay, John, Whitehaven	1818
	M'Kinnell, Andrew, Clouden, Dumfries	1860
	Mackinnell, J. B. A., yr. of M'Murdieston, Dumfries	1860
2400	Mackinnon, Alexander Kenneth, Corry, Broadford	1827
	Mackinnon, Neil, of Demerara	1829
	Mackinnon, William Alexander, of Mackinnon, M.P.	1811
	Mackintosh, Æneas, of Daviot, Inverness	1839
	Mackintosh, Æneas, of Balnespeck, Inverness	1846
	Mackintosh, Æneas W., of Raigmore, Inverness	1844

		Admitted
	Mackintosh, Lieut.-Col. Alexander, of Far, Inverness	1839
	Mackintosh, Alexander, Edinburgh	1856
	Mackintosh, Angus, of Holm, Inverness	1844
	Mackintosh, George, of Geddes, Nairn	1832
2410	Mackintosh, George Gordon, Balnespeck, Inverness	1846
	Mackintosh, James, of La Mancha, Leadburn	1851
	Mackintosh, Robert T., Seedsman, Edinburgh	1854
	Mackintosh, William, Australia	1813
	Mackintosh, William S., Garlichill, Auldearn, Nairn	1865
	M'Kirdy, John Gregory, of Birkwood, Lesmahagow	1850
	M'Kissack, Charles, Culblair, Ardersier	1865
	M'Kissack, James, Heathmount, Nairn	1865
	M'Knight, Alexander, Burncroft Lodge, Salop	1860
	Maclachlan, Alex., Easter Longhaugh, Bishopton	1850
2420	Maclachlan, George, W.S., Edinburgh	1843
	Maclachlan, Robert, of Maclachlan	1817
	Maclachlan, W. A., of Anchentroig, Balfron	1862
	Maclagan, Douglas, M.D., Professor of Medical Jurisprudence, University of Edinburgh	1853
	Maclagan, Peter, Catter, Drymen	1847
	M'Lagan, Peter, of Pumpherston, Mid-Calder	1847
	Maclaine, Hugh, late of Killundine	1847
	Maclanachan, James, Van Dieman's Land	1855
	Maclaren, Charles, Moreland Cottage, Edinburgh	1833
	Maclaren, Donald, Corrychrone, Callander	1859
2430	Maclaren, Duncan, Newington House, Edinburgh	1853
	Maclaren, D. S., Banker, Fort-William	1858
	Maclaren, Dr John, of Balemenoch, Blairgowrie	1839
	M'Laren, James, Carnalarick, Ballater	1859
	M'Laren, James, Gifford Bank, Haddington	1864
	M'Laren, John, Monzie, Blair-Athole	1859
	M'Laren, John, Millhill, Inchture	1858
	M'Laren, John, Muirpersie, Kirriemuir	1859
	M'Laren, Joseph, Muirpersie, Kirriemuir	1859
	M'Laurin, James, Greenhill, Dalbeattie	1858
2440	M'Lean, Alexander, Ballmaglen, Campbeltown	1857
	Maclean, Alexander, of Ardgour, Bonaw	1856
	Maclean, Alexander, of Carsaig, Aros	1835
	Maclean, Colonel Allan Thomas	1835
	Maclean, Archibald D., London	1837
	Maclean, Colin, of Lagan, Islay	1838
	Maclean, Donald, of Boreray	1822
	Maclean, Duncan, Bellnollow, Crieff	1861
	Maclean, George, Hynish, Tyree	1849

		Admitted
	Maclean, Hector Frederick, W.S., Edinburgh	1854
2450	Maclean, Hugh, Brighton	1827
	M'Lean, James, St Martins, Fortrose	1857
	Maclean, James, Clerk of Supply, Wigtown	1860
	Maclean, John, Procurator-Fiscal, Perth	1860
	M'Lean, Lauchlan, Pittilie, Aberfeldy	1860
	Maclean, Dr Lachlan, Tobermory	1823
	Maclean, Neil, Land-Surveyor, Inverness	1837
	Maclean, Patrick, of Hawkhill, Fortrose	1845
	Maclean, William, of Plantation, Glasgow	1838
	Macleay, Alexander D., Bilbster, Wick	1846
2460	Macleay, Kenneth, of Newmore, Wick	1839
	M'Lellan, W. H., of Marks, Kirkcudbright	1857
	Maclelland, Thomas, North Balfern, Kirkinner	1857
	MacLennan, Alexander F, Meikle Urchany, Nairn	1865
	MacLennan, Donald, junior, Muirton, Munlochy	1865
	Maclennan, John	1840
	M'Lennan, John, Carnock, Strathconan, Beauly	1864
	Macleod, Alexander Norman	1817
	Macleod, Donald, Coulmore, Inverness	1830
	Macleod, Donald, Claggan, Dunvegan	1841
2470	Macleod, John N., Banker, Kirkcaldy	1849
	Macleod, Martin, of Drynoch, Dunvegan	1831
	Macleod, Norman, of Dalvey, Forres	1839
	Macleod, Norman, of Macleod, London	1839
	Macleod, Robert Bruce Æneas, of Cadboll, Tain	1854
	Macleod, Colonel William	1817
	M'Michael, George, Fallowheat, Castle-Douglas	1860
	Macmillan, Donald, of Lephenstrath, Campbeltown	1825
	Macmillan, James, of Lamloch, Carsphairn	1834
	M'Millan, John, Newton-Stewart	1860
2480	M'Millan, John Gordon, of Ballinakill, Clachan	1861
	M'Minn, Francis, Edinburgh	1854
	M'Murchy, Donald, Backs, Campbeltown	1857
	M'Murrich, James, of Stuckgown	1852
	M'Murtrie, John, Banker, Ayr	1854
	M'Nab, Alex., of Techmuiry, Glenochil, Stirling	1865
	M'Nab, Duncan, Writer, Stirling	1855
	Macnab, James Monro	1837
	Macnaghten, J. Steuart, of Inver Trossach, Callander	1855
	M'Nair, James, of Auchineck, Drymen	1838
2490	M'Nair, James, Smerly, Campbeltown	1857
	MacNair, John, Brewer, Leith	1857
	M'Naughton, Alexander, Remony, Kenmore	1857

		Admitted
	M'Naughton, Alexander, Kerriemore, Fortingal	1859
	Macnaughton, James, of Smithfield, Ayr	1854
	M'Naughton, Thomas, Carrine, Campbeltown	1857
	Macneale, Hector, of Ugadale, Campbeltown	1848
	M'Neill, Alexander, of Bordland, Noblehouse	1859
	M'Neill, Archibald, P.C.S, Edinburgh	1846
	M'Neill, Charles, Lossit, Ballygrant	1861
2500	Macneill, John, of Ardnacross, Aros	1847
	M'Neill, M. M., younger of Carskey, Campbeltown	1839
	M'Neill, Robert, Letter, Killearn	1857
	M'Neill, John Carstairs, of Gigha	1860
	M'Neillie, William, of Castlehill, Dumfries	1861
	M'Nie, William C., Stirling	1859
	M'Niven, Alex., Sheemore, Luss	1857
	M'Noe, John, Flatts of Cargen, Dumfries	1860
	M'Onie, John, Auchmour, Drymen	1857
	Maconochie, Robert Blair, W.S., Edinburgh	1852
2510	M'Phail, Alex., Drumgarve, Campbeltown	1857
	Macpherson, Alex., M.D., Lauriston Castle, Cramond	1841
	Macpherson, Allan, London	1822
	Macpherson, Captain, Breakachy, Laggan	1854
	Macpherson, Ewan, of Cluny Macpherson, Kingussie	1827
	Macpherson, Hugh, Slafarquhar, Denny	1864
	Macpherson, James, Nuide, Kingussie	1856
	Macpherson, James, Dromore, Croy, Ardersier	1865
	Macpherson, John, Blantyre, Glasgow	1856
	Macpherson, John, Kenmore	1857
2520	Macpherson, John, Killihuntly, Kingussie	1860
	Macpherson, Lachlan, Biallidmore, Kingussie	1839
	Macpherson, William, of Blairgowrie	1822
	M'Queen, James, Arneive, Blairdrummond	1857
	Macqueen, Robert, of Braxfield, Biggar	1842
	Macqueen, Captain Simon	1820
	Macrae, Alexander, Akernish, Caradish	1832
	Macrae, Archibald, M.D.	1839
	Macrae, Donald, Luskintyre, Harris	1850
	Macrae, Donald, Banker, Kingussie	1863
2530	Macrae, Rev. Finlay, North Uist	1841
	Macredie, Pat. Boyle Mure, of Perceton, Irvine	1830
	Macritchie, Charles Elder	1831
	Macritchie, Thomas Elder, of Craigton, W.S., Edin.	1831
	M'Tavish, Alexander S., Killin	1861
	M'Tavish, Duncan, Dalmore, Campbeltown	1857
	Mactier, Alexander Walker, of Durris, Aberdeen	1848

		Admitted
	Macvicar, Rev. J. G., D.D., Moffat	1828
	Macwilliam, Alexander, Bucharn, Huntly	1850
	M'William, James, Upper Kidston, Peebles	1855
2540	Madden, Henry R., M.D., Brighton	1839
	Main, Alexander James, Whitehill, Lasswade	1847
	Maitland, George F., of Hermand, West Calder	1852
	Maitland, George R., W.S., Edinburgh	1863
	Maitland, James, Scotstown, Insch, Aberdeen	1856
	Maitland, James, junr., Little Methlic, Methlic	1858
	Maitland, Rev. James, D.D., Kells, New Galloway	1860
	Maitland, John, of Freuch, Balgreggan, Stranraer	1865
	Maitland, William, Netherton, Insch	1858
	Makgill, George, of Kemback	1841
2550	Malcolm, John, of Poltalloch, Lochgilphead	1860
	Malcolm, John Wingfield, yr. of Poltalloch, M.P.	1864
	Malcolm, W. E., of Burnfoot, Langholm	1840
	Mangles, George, Givendale, Ripon, Yorkshire	1861
	Mann, John, Glasgow	1847
	Mann, John, Meadowfield, Auldearn, Nairn	1865
	Mansfield, Thomas, C.A., Edinburgh	1827
	Manson, James, Oakhill, Old Meldrum	1855
	Marjoribanks, Dudley Coutts, of Guisachan, M.P.	1856
	Marjoribanks, John, Roseneath	1856
2560	Marjoribanks, William, Merchant, Leith	1854
	Marr, Dr James, of Alderston, Mid-Calder	1861
	Marr, James A., Alderston, Mid-Calder	1864
	Marr, William Smith, Mill of Tillyhilt, Tarves	1855
	Marshall, James, Jeweller, Edinburgh	1833
	Marshall, John, Killbreck, Lairg	1847
	Marshall, John, younger of Curriehill, Edinburgh	1854
	Marshall, Robert, Gateside, Kirkliston	1850
	Marshall, Thomas, The Howes, Annan	1860
	Martin, Donald, Glasgow	1858
2570	Martin, James, Flesher, Aberdeen	1858
	Martin, James Watson, Broomhouse, Corstorphine	1850
	Martin, John, Claggan, Kenmore	1858
	Martin, Montague J., Mansion House, Greenock	1859
	Martin, Dr Nicol, of Glendale, Dunvegan	1854
	Martin, Samuel Elliott, Seed-merchant, Hull	1865
	Martin, William, Kilmartin, Lochgilphead	1844
	Mason, Robert, of Meadowbank, Edinburgh	1859
	Mason, Thomas, Palinsburn Cottage, Coldstream	1854
	Mather, Daniel, Hallrule, Hawick	1863
2580	Matheson, Alexander, of Ardross, M.P.	1846

		Admitted
	Matheson, Major-General Thomas	1847
	Mathew, William, Newton of Kingsdale, Kennoway	1862
	Mathews, Niven, Whitehills, Garliestown	1853
	Mathie, James, Banker, Stirling	1864
	Mathieson, George, of Clifton Lodge, Edinburgh	1854
	Matthew, Alexander, Forret, Cupar-Fife	1861
	Maxton, John, Drylaw House, Davidson's Mains	1835
	Maxwell, Edward Heron, of Teviotbank, Hawick	1861
	Maxwell, Francis, of Breoch, Dumfries	1841
2590	Maxwell, Francis, Glasgow	1844
	Maxwell, Francis, of Drumpark, Dumfries	1861
	Maxwell, John Hall, of Dargavel, C.B., Secretary of the Society	1838
	Maxwell, Robert, Bellochgair, Campbeltown	1857
	Maxwell, Wellwood H., of Munches, Dalbeattie	1839
	Maxwell, Wellwood, of The Grove, Dumfries	1858
	Maxwell, Wellwood, of Glenlee, New Galloway	1855
	May, George, Civil Engineer, Inverness	1839
	Mayne, Robert, Edinburgh	1838
	Meall, James, Buttergask, Coupar-Angus	1852
2600	Mears, William, Commission Agent, Edinburgh	1859
	Meek, George, of Campfield	1814
	Megget, Thomas, W.S.	1811
	Meiklam, John, of Gladswood, Melrose	1857
	Meikle, David, Clunie Mains, Kinglassie	1854
	Meikle, James, Writer, Kilmarnock	1858
	Meikle, James, Blackburn Hall, Bathgate	1864
	Meikle, John, Nether Mains, Kilwinning	1858
	Meiklejon, John, Foundry, Dalkeith	1862
	Mein, Alexander, Woodhead of Cairness, Cortes	1864
2610	Mein, Andrew Whytock, of Hunthill, Jedburgh	1861
	Mein, Benjamin, Roxburgh Barns, Kelso	1863
	Mein, Nicol A., Marsh House, Canonbie	1860
	Mein, Robert, Factor to the Duke of Bedford	1838
	Mein, William, Seedsman, Kelso	1863
	Meldrum, Alex., of Easter Kincaple, Guard Bridge	1841
	Meldrum, David, of Craigfoodie, Cupar-Fife	1857
	Meldrum, Edward, Chemical Works, Bathgate	1863
	Meldrum, James, Durie, Leven	1860
	Melrose, Jonathan, Newbigging, Coldstream	1854
2620	Melville, James Moncrieff, W.S., Edinburgh	1848
	Melville, James, Callange, Ceres	1861
	Melville, John Whyte, of Bennochy, St Andrews	1819
	Melvin, Charles, Ratho Mains, Ratho	1862

		Admitted
	Melvin, James, Bonnington, Ratho	1849
	Menzies, Andrew, of Balornock, Glasgow	1857
	Menzies, Duncan, Edinburgh	1863
	Menzies, Duncan, Braemore, Lochbroom, Dingwall	1864
	Menzies, Fletcher Norton, Tirnie, Aberfeldy	1841
	Menzies, Graham, London	1853
2630	Menzies, James, Auch, Tyndrum	1857
	Menzies, James A. Robertson, Surgeon, Annat	1849
	Menzies, John S., of Chesthill, Aberfeldy	1821
	Menzies, Ranald, of Culdares, Fortingall	1842
	Mercer, Daniel, Achamore, Dunoon	1861
	Mercer, Græme R., of Gorthy, Perth	1850
	Mercer, John, Ardnadam, Dunoon	1861
	Mercer, Major, of Huntingtower, Perth	1853
	Mercer, R., of Scotsbank, Ramsay Lodge, Portobello	1863
	Merry, James, of Belladrum, M.P.	1838
2640	Methven, Thomas, Nurseryman, Edinburgh	1865
	Middleton, Charles Stuart, Merchant, Liverpool	1840
	Middleton, George, Cornton, Ferintosh, Dingwall	1864
	Middleton, John, Edinburgh	1863
	Middleton, Robert, Edinburgh	1864
	Middleton, William, Bridgefoot, Monymusk	1858
	Mill, James, Surgeon, Thurso	1839
	Mill, Robert, Overseer, Balgowan, Perth	1861
	Millar, C. H., Merchant, Montrose	1853
	Millar, James Lawson, Waukmill, Dunfermline	1852
2650	Millar, James, Mills of Torr, Blairdrummond	1864
	Millar, John, Edinburgh	1848
	Millar, Thomas, West Briggs, Kirkliston	1853
	Millar, Thomas, of Balliliesk, Muckart	1854
	Miller, Captain Alexander Penrose	1843
	Miller, George, of Frankfield, Glasgow	1814
	Miller, George, Cattle Agent, Delvine, Dunkeld	1861
	Miller, Hew, Ochtertyre, Crieff	1853
	Miller, John, of Leithen, Millfield House, Falkirk	1847
	Miller, John, Dounreay, Thurso	1861
2660	Miller, O. G., Merchant, Dundee	1843
	Miller, William, of Manderston, M.P., Leith	1864
	Milligan, James, Hayfield, Thornhill	1855
	Mills, George, Greenend, St Boswells	1857
	Mills, George, Horsburgh Castle, Peebles	1859
	Mills, Thomas, Mount Benger, Selkirk	1863
	Milne, Alexander, Corse of Kinnoir, Huntly	1858
	Milne, Alexander, of Gartfarrie, Moodiesburn	1844

		Admitted
	Milne, Alexander, Mill of Allathan, Udny	1855
	Milne, George, of Kinaldie, Aberdeen	1851
2670	Milne, George, Haddo, Methlic	1851
	Milne, James, Nethertown, Rosehearty	1856
	Milne, James, Pitsligo Castle, Rosehearty	1856
	Milne, James, Kilduthie, Banchory	1857
	Milne, James	1859
	Milne, James, Cairnhill, Huntly	1862
	Milne, Nicol, of Faldonside, Melrose	1841
	Milne, Nicol, Dryhope, Selkirk	1863
	Milne, Peter, Edinburgh	1861
	Milne, William, Mains of Waterton, Ellon	1851
2680	Mitchell, Alexander, of Sauchrie, Maybole	1851
	Mitchell, Alexander, Alloa	1857
	Mitchell, Alexander, of Stow, Carolside, Earlston	1863
	Mitchell, Andrew, Alloa	1848
	Mitchell, David, Burnton, Laurencekirk	1861
	Mitchell, Duncan, Blairvockie, Luss	1857
	Mitchell, George, Authnagathle, Whitehouse	1852
	Mitchell, Houston, of Polmood, Peeblesshire,	1848
	Mitchell, Hugh, Balligreggan, Campbeltown	1857
	Mitchell, James, Little Knox, Castle-Douglas	1851
2690	Mitchell, James, Homeston, Campbeltown	1857
	Mitchell, James P., Traprain, Prestonkirk	1855
	Mitchell, James, Banker, Pitlochry	1864
	Mitchell, John, Inverscaddle, Ardgour	1843
	Mitchell, John, Ballemenach, Campbeltown	1850
	Mitchell, John, Flisk Mill, Newburgh	1861
	Mitchell, John, Lordscairney, Cupar-Fife	1862
	Mitchell, John, Banker, Dingwall	1864
	Mitchell, John M., Merchant, Leith	1832
	Mitchell, Joseph, Civil Engineer, Inverness	1836
2700	Mitchell, Robert, Cadham, Markinch	1852
	Mitchell, Robert, Skelpie, Pitlessie	1859
	Mitchell, Samuel, Strath, Campbeltown	1850
	Mitchell, Thomas, Kirkhope, Selkirk	1853
	Mitchell, William, Merchant, Montrose	1862
	Mitchell, William Gillespie, of Carwood, Biggar	1849
	Mitchell, William, Ribigill, Tongue, Lairg	1863
	Mitchelson, Arch. Hepburne, Old Faskally	1832
	Moffat, George, Strathconan, Beauly	1861
	Moffat, James, Garwald, Langholm	1850
2710	Moffat, James, Gateside, Kirkconnel, Sanquhar	1860
	Moffat, John, Craik, Hawick	1850

		Admitted
	Moffat, Thomas, Drumbuie, Sanquhar	1862
	Moffat, William, Craigbeck, Moffat	1851
	Moffat, William, Town-Clerk, Dingwall	1863
	Moffat, William, Shirva, Kirkintilloch	1864
	Moffat, William, Easter Kinleith, Currie	1864
	Moir, Benjamin, Merchant, Aberdeen	1840
	Moir, James, Mains of Wardhouse, Insch	1858
	Moir, John M., of Hillfoot and Milton, Dollar	1834
2720	Moir, Robert, of Easterton, Tarty, Ellon	1851
	Moncrieff, Alexander, W.S., Perth	1842
	Moncrieff, Alexander, of Barnhill, Perth	1852
	Moncrieff, George, Solicitor, Perth	1852
	Moncrieff, Robert Scott, of Fossoway, Dalkeith	1831
	Monro, Alex., of Craiglockhart, Edinburgh	1835
	Monro, Alexander Binning, of Auchinbowie, Stirling	1833
	Monro, David, of Allan, Tain	1851
	Monteath, Alexander, of Cauldhame, Stirling	1864
	Monteith, Bryden, Liberton Tower, Edinburgh	1846
2730	Monteith, Robert, of Carstairs	1837
	Montgomery, John H., of Newton	1846
	Moore, John Carrick, of Corsewall, Stranraer	1839
	Moray, Charles Home Drummond, Abercairney, Crieff	1852
	Morison, Alex., of Bognie, Mountblairy House, Turriff	1850
	Morison, James, Rossie, Dunning	1861
	Morison, James G., Glasgow	1850
	Morison, John B. Brown, of Finderly, Kinross	1862
	Morrieson, Robert, Edinburgh	1833
	Morrison, Charles, of Islay, Bowmore	1855
2740	Morrison, Harry L. L., Guise, Whitehouse, Aberdeen	1858
	Morrison, James, Glasgow	1850
	Morrison, James, Mains of Montcoffer, Banff	1856
	Morrison, James, of Livilands, Stirling	1864
	Morrison, John, Wester Dalmeny, South Queensferry	1859
	Morrison, William, Cairnie, Forteviot	1861
	Morton, Hugh, Engineer, Edinburgh	1835
	Morton, James	1857
	Morton, John, Lambieletham, St Andrews	1861
	Morton, John, North Muirton, Perth	1861
2750	Mosman, Hugh, of Auchtyfardle, Lanark	1859
	Mossman, Adam, Edinburgh	1864
	Moubray, John Marshall, W.S., Edinburgh	1843
	Moubray, Robert, Cambus Distillery, Stirling	1862
	Mounsey, J. T., of Kingfield, Longtown, Cumberland	1865
	Moyes, James, Balwearymill, Kirkcaldy	1861

		Admitted
	Mudie, John, of Pitmuies, Forfar	1840
	Muir, George W., Caberston, Innerleithen	1852
	Muir, James, Barone Park, Rothesay	1849
	Muir, James, Hardington Mains, Wiston, Biggar	1864
2760	Muir, John	1843
	Muir, John, Lochfergus, Kirkcudbright	1859
	Muir, W. H., S.S.C., Edinburgh	1863
	Muirhead, Claud, Edinburgh	1820
	Muirhead, E. W., Lethendy, Scone, Perth	1862
	Muirhead, George, Durdie, Errol	1863
	Muirhead, John James, Edinburgh	1865
	Mundell, David, Auchindrean, Lochbroom	1858
	Munro, Andrew, Balintraid, Invergordon	1864
	Munro, Donald, Stornoway	1857
2770	Munro, Donald, Conchra, Contin, Dingwall	1864
	Munro, John, Fairnington, Kelso	1853
	Murdoch, Alexander, Hilton, Bishopbriggs	1857
	Murdoch, James, Carntyne, Shettleston	1854
	Murdoch, John Burn, of Gartincaber, Advocate	1853
	Murdoch, Peter, of Langbank, Newton-Mearns	1839
	Murdoch, Robert, Hallside, Cambuslang	1857
	Murdoch, Thomas, Westwood, Blair-Drummond	1864
	Murdoch, William, Huntly	1856
	Mure, Lieut.-Colonel William, of Caldwell, Beith	1861
2780	Mure, William, Kirkcudbright	1841
	Murray, Andrew, of Conland	1846
	Murray, Anthony, of Dollerie, W.S., Edinburgh	1828
	Murray, David, Edinburgh	1864
	Murray, Rev. George, of Troquhain, New Galloway	1860
	Murray, George, New Zealand	1854
	Murray, Gilbert B., Chapel Rossan, Stranraer	1865
	Murray, Jack W., Captain R.N.	1843
	Murray, James, Monkland Iron Works, Glasgow	1828
	Murray, James, of Craigend, Drochil Castle, Peebles	1840
2790	Murray, James, East Barns, Dunbar	1850
	Murray, James, Dumfries Arms Hotel, Old Cumnock	1857
	Murray, James, Strathleven, Dumbarton	1861
	Murray, John, Merchant, Laurencekirk	1859
	Murray, John, Grougar Mains, Kilmarnock	1860
	Murray, John L., of Heavyside, Biggar	1862
	Murray, Lieut.-Col. John, of Polmaise, Stirling	1863
	Murray, Dr John, Kersknow, Kelso	1863
	Murray, John, of Wooplaw, Galashiels	1863
	Murray, Joseph, of Ayton	1820

		Admitted
2800	Murray, Kenneth, Banker, Tain	1851
	Murray, Robert, Spittal, Penicuik	1850
	Murray, Robert, Edinburgh	1858
	Murray, Robert, Strathgray, Blair-Athole	1861
	Murray, Colonel Samuel Hood, Aberfeldy	1834
	Murray, Sutherland, Kirkton, Golspie	1851
	Murray, Thomas, Eastside, Penicuik	1857
	Murray, Thomas Graham, W.S., Edinburgh	1852
	Murray, Walter, Walston, Penicuik	1854
	Murray, William, Kilcoy, Dingwall	1856
2810	Murray, William, Mains of Pittendreigh, Turriff	1858
	Murray, William Hugh, of Geanies, Tain	1846
	Murrie, John, Provost of Stirling	1859
	Mustard, Alexander, Davo Mains, Fordoun	1859
	Mutrie, David, Merchant, Glasgow	1804
	Mutter, John, Wester Melville, Lasswade	1857
	Myers, George Cooper, Town-Clerk, Montrose	1858
	Mylne, Thomas, Niddrie Mains, Liberton	1860
	Mylne, William, Lochhill, Aberlady	1841
	NORTHESK, The Right Hon. William, Earl of	1843
2820	NAPIER, The Right Hon. Francis, Lord, K.T.	1843
	NAPIER, The Hon. Wm., of Broadmeadows, Selkirk	1863
	NEAVES, The Hon. Lord	1846
	NAPIER, Sir Robert John, Milliken, of Milliken, Bart.	1848
	NEPEAN, Sir Molyneux Hyde, of Loders Court, Bart.	1865
	Nairne, John Mellis, of Dunsinnan, Perth	1852
	Naismith, Alexander, Windlestrawlee, Edinburgh	1852
	Napier, Dugald, Australia	1857
	Napier, George, Advocate, Sheriff of Peeblesshire	1840
	Napier, Robert, of Shandon, Helensburgh	1844
2830	Nasmyth, Robert, Edinburgh	1839
	Neilson, James, Rose Hall, Falkirk	1864
	Nelson, Michael, Gallamuir, Stirling	1859
	Nelson, William, Claddens, Bishopbriggs	1857
	Newall, John, Mexico	1845
	Newton, James Ewan, Linnbank House, Lanark	1838
	Newton, Captain Hay, of Newton, Haddington	1865
	Newton, Robert P., of Castlelandhill, Kerse, Falkirk	1837
	Nicholson, Alexander, Writer, Cupar-Fife	1864
	Nicholson, Robert, Lochbank, Dumfries	1861
2840	Nicol, James Dyce, of Ballogie, Aboyne	1853
	Nicoll, Alexander	1844

		Admitted
	Nicolson, Major Allan Macdonald, of Ardmore	1819
	Nicolson, James Badenach, yr. of Glenbervie, Fordoun	1857
	Nicolson, Neil, Ardlamont, Greenock	1857
	Nielson, Andrew, Bank of Scotland, Glasgow	1843
	Nimmo, James, Sighthill, Corstorphine	1847
	Nimmo, Matthew, Foot of Green, Stirling	1852
	Nisbet, John, Rumbleton, Greenlaw, Dunse	1854
	Nisbet, Ralph P., Estate Office, Thorney, Peterborough	1855
2850	Nisbett, John More, of Cairnhill, Drum, Edinburgh	1847
	Niven, Alexander T., C.A., Edinburgh	1860
	Nivison, Thomas, Burn, Thornhill	1852
	Nixon, William, of Lynnwood, Hawick	1865
	Noble, Charles, younger of Berryhill, Peterhead	1858
	Noble, John, London	1838
	Noble, William, London	1838
	Norie, Henry Hay, Factor, Kilmarnock	1862
	Norman, William, Oughterside, Carlisle	1860
	Normand, James, of Whitehill, Aberdour, Fife	1861
2860	OGILVY, The Hon. William, of Loyal, Forfar	1823
	OGILVY, The Hon. William Bruce, of Cowden, Dollar	1862
	ORMIDALE, The Hon. Lord	1854
	OGILVY, Sir John, of Inverquharity, Bart., M.P.	1824
	ORDE, Sir John Powlett, of Kilmory, Bart.	1830
	ORR, Sir Andrew, of Harviestoun, Glasgow	1844
	Odams, James, London	1859
	Ogilvie, Archibald, Old Liston, Ratho	1854
	Ogilvie, Captain William, R.N.	1820
	Ogilvie, William, of Chesters, Jedburgh	1809
2870	Ogilvie, William, Broadhaugh, Hawick	1853
	Ogilvie, George, Holefield, Kelso	1860
	Ogilvy, John, of Inshewan, Forfar	1836
	Ogilvy, John, Harecraig, Dundee	1859
	Ogilvy, Peter Wedderburn, of Ruthven, Meigle	1826
	Ogilvy, Thomas, younger of Ruthven, Meigle	1844
	Ogilvy, Thomas, of Corrimony, Inverness	1838
	Ogston, Alexander, of Ardoe, Aberdeen	1840
	Oliver, Andrew, South Fallowknowe, Coldingham	1863
	Oliver, James, Howpasley, Hawick	1850
2880	Oliver, James, Bridge House, Hawick	1852
	Oliver, Robert, of Blakelaw, Kelso	1853
	Oliver, Thomas, Redheughs, Corstorphine	1856
	Oliver, W. Elliot, Glenforsa, Mull	1858

		Admitted
	Oliver, William, of Langraw, Bonchester Bridge	1863
	Ord, John, of Muirhouselaw, Nisbet, Kelso	1841
	Orde, John William Powlett, younger of Kilmory	1858
	Ormiston, William T., of Glenburn Hall, Jedburgh	1848
	Oswald, Alexander Haldane, of Auchincruive, Ayr	1845
	Oswald, James Townshend, of Dunnikier, Kirkcaldy	1848
2890	Otto, William Ellison, Factor, Newbattle, Dalkeith	1863
	Ovens, Thomas, Merchant, Galashiels	1851
	†POLWARTH, The Right Hon. Henry, Lord	1829
	POLWARTH, The Hon. Walter Scott, Master of	1863
	POLLOK, Sir Hew Crawford, of Pollok, Bart.	1846
	PRINGLE, Sir John, of Newhall, Bart.	1810
	Pagan, Allan Cuningham, Invergeldie, Comrie	1852
	Pagan, Samuel A., M.D., Edinburgh	1848
	Pagan, William, of Clayton, Cupar-Fife	1845
	Park, Alexander B., Woodend, Kelso	1863
2900	Park, James, Cliftonhall Mains, Ratho	1859
	Park, James, Stoneyhill, Musselburgh	1863
	Park, Thomas, Stoneyhill, Musselburgh	1854
	Park, William, of Blegbie, Melrose	1849
	Parker, John, Nether Broomlands, Irvine	1857
	Parkes, Samuel, London	1817
	Pate, Thomas, South Draffan, Lesmahagow	1857
	Paterson, Alexander, Wine-Merchant, Leith	1840
	Paterson, Alexander, Mains of Mulben, Keith,	1853
	Paterson, Alexander, Carmacoup, Douglas	1860
2910	Paterson, Archibald, Meadowfield, Corstorphine	1848
	Paterson, David, Dreghorn	1857
	Paterson, D. A., Merchant, Leith	1854
	Paterson, George, of Castle Huntly	1841
	Paterson, James, Whitehouse, Lamlash	1853
	Paterson, James, of Longbedholm, Moffat	1860
	Paterson, James W., Craigend, Dumfries	1861
	Paterson, James, Chapelhill, Hawick	1862
	Paterson, James E., Linlathen, Broughty-Ferry	1862
	Paterson, John, East Preston, Kirkbean	1850
2920	Paterson, John, junior	1847
	Paterson, John, Macoriston, Doune	1852
	Paterson, John, Skirling Mains, Biggar	1857
	Paterson, John, Ewingston, Gifford	1860
	Paterson, John, Eastfield, Penicuik	1860

		Admitted
	Paterson, John, Howcleuch, Moffat	1862
	Paterson, J. W., Terrona, Langholm	1854
	Paterson, P. Hay, of Carpow, Newburgh	1849
	Paterson, Robert, of Birthwood, Biggar	1848
	Paterson, Robert, of Brocklehirst, Dumfries	1835
2930	Paterson, Walter, Merchant, Glasgow	1851
	Paterson, William, Twiglees, Lockerbie	1851
	Paterson, William, of Ettrickhall, Selkirk	1863
	Patison, John, W.S., Edinburgh	1846
	Paton, Alexander, Macnairston, Ayr	1857
	Paton, Daniel, Francesfield, Logiealmond	1864
	Paton, John, Balbedie, Lochgelly	1859
	Paton, John, of Crailing, Jedburgh	1833
	Paton, John, of Grandholm, Aberdeen	1841
	Paton, Robert, Cloberhill, Dumbarton	1854
2940	Patterson, John, Westerton of Cowie, Stirling	1850
	Patterson, Robert, Stirling	1851
	Pattison, A. Dunn, of Dalmuir, Glasgow	1864
	Patton, George, of Cairnies, Advocate, Edinburgh	1843
	Pattullo, George, Keillor, Coupar-Angus	1861
	Pattullo, Peter, Eassie Farm, Glammis	1861
	Paul, Rev. John, D.D., Edinburgh	1839
	Paul, William, Advocate, Aberdeen	1855
	Paul, William, Kilnflat, Forres	1855
	Payne, James, Carruchan, Dumfries	1860
2950	Peake, John, Craigend, Stow	1857
	Pearson, Andrew A., of Springfield, Carluke	1854
	Pearson, David A., of North Cliff, Queensferry	1863
	Peat, John, Manor, Stirling	1858
	Peddie, William, of Blackruthven, Perth	1828
	Pelham, C. Thursby, Etteridge, Kingussie	1864
	Pender, George, Dumbreck, Kilsyth	1857
	Pender, Thomas	1839
	Penman, John, Bonally, Colinton	1859
	Penny, Thomas, Bartlehill, Coldstream	1863
2960	Peter, Charles, Canterland, Marykirk	1854
	Peter, John, Croyard, Beauly	1854
	Peter, John, of Over Possil, Glasgow	1862
	Peter, Robert, Banker, Aberfeldy	1849
	Peterkin, William, Woodside, Cullen	1861
	Philip, George, Boynds, Keith Hall	1856
	Philip, John, Polton Mains, Lasswade	1851
	Philip, Robert, Leith	1844
	Philip, William, Lofthillock, Keith Hall	1858

		Admitted
	Phillips, Hugh, Cracrop, Stapleton, Carlisle	1860
2970	Phillips, John, Laighpark, Milngavie	1854
	Phillips, John Douglas, St Colme, Aberdour	1862
	Philp, Robert, Bridge of Allan	1864
	Phin, John, S.S C., Edinburgh	1863
	Picken, Jas., Laigh Langside, Craigie, Kilmarnock	1857
	Picken, James H., of Hillhouse Lodge, Fenwick	1857
	Picken, John, Mansfield Mains, New Cumnock	1857
	Picken, Robert, Burnkirk, Newton-Stewart	1860
	Pierson, James Alexander, of The Guynd, Arbroath	1863
	Pirie, James, Orchardton, Udny	1855
2980	Pitcairn, John, of Pitcullo, Cupar	1841
	Pitcairn, John, Kinnaird, Newburgh	1863
	Pitcairn, William, of Cunnoquhie, Cupar-Fife	1861
	Pitman, Frederick, W.S., Edinburgh	1859
	Pittendrigh, Alexander, Glaslaw, New Pitsligo	1858
	Pittendrigh, Alexander, Newseat, Fraserburgh	1859
	Pittendrigh, John, Bodychell, Fraserburgh	1857
	Playfair, Dr Lyon, C.B., Professor of Chemistry, University of Edinburgh	1859
	Plenderleith, Archibald, Moorfoot, Gorebridge	1859
	Plummer, Charles Scott, of Sunderland Hall, Selkirk	1842
2990	Plummer, George Hay, Melville, Dalkeith	1850
	Plummer, John, Edinburgh	1860
	Pollexfen, James R., of Cairston, W.S., Edinburgh	1841
	Pollok, Allan, of Faside, Newton Mearns	1844
	Pollok, Arthur, of Lochlibo, Broom, Newton Mearns	1815
	Polson, John, Moy, Dingwall	1853
	Ponton, George, Woolston, Linlithgow	1852
	Pople, John B., Birnam Hotel, Dunkeld	1861
	Porteous, Alexander, of Lauriston, Montrose	1851
	Porter, James, Monymusk, Aberdeen	1855
3000	Porter, John Thos. Brown, Lincoln	1859
	Pott, Gideon, of Knowsouth, Jedburgh	1854
	Potts, Andrew, Lewinshope, Selkirk	1863
	Powrie, Archibald, Lairwell, Perth	1861
	Powrie, James, of Reswallie, Forfar	1849
	Prentice, George, of Strathore, Kirkcaldy	1855
	Prentice, George, junior, Balmuto, Kirkcaldy	1864
	Prentice, James, Bankhead, Kirkcaldy	1861
	Prentice, John, Edinburgh	1861
	Primrose, James, Turniedykes, Ford	1855
3010	Primrose, James Thomson, Sauchland, Ford	1863
	Pringle, Alexander, of Whytbank, Selkirk	1859

		Admitted
	Pringle, David, of Wilton Lodge, Hawick	1863
	Pringle, David, Hyndlee, Bonchester Bridge	1863
	Pringle, James Hall, of Dirrie, Cleethaugh, Jedburgh	1863
	Pringle, James Thomas, of Torwoodlee, Selkirk	1863
	Pringle, John, Agricultural Implement Agent, Edin.	1863
	Pringle, John, Garvald, Gorebridge	1865
	Pringle, Robert K.	1852
	Proudfoot, John, Pinkiehill, Musselburgh	1848
3020	Pullar, John, junior, Keirfield, Bridge of Allan	1864
	Purdie, Thomas, Edinburgh	1856
	Purves, Andrew, Pressmenan, Stenton	1860
	Purves, Charles, Lugton, Dalkeith	1855
	Purves, George, Elemscleugh, Innerwick	1853
	Purves, James, Thurdistoft, Thurso	1839
	Purves, James, junior, Lochend, Dunnet, Thurso	1861
	Purves, John, of Kinaldie, St Andrews	1844
	Purves, William, Burnfoot, Kelso	1859
	Purvis, John, Balbirnie Mill, Markinch	1851

3030	Richmond and Lennox, His Grace Charles, Duke of	1840
	*Roxburghe, His Grace James, Duke of, K.T.	1837
	†Rosebery, The Right Hon. Arch., Earl of, K.T.	1806
	†Rosslyn, The Right Hon. James, Earl of	1835
	Rollo, The Right Hon. John, Lord	1857
	Richardson, Sir John Stewart, of Pitfour, Bart.	1823
	Riddell, Sir Thomas Miles, of Sunart, Bart.	1845
	Radcliffe, Sir Joseph, of Millsbridge, Bart.	1820
	Russell, Sir William, of Charlton, Bart.	1853
	Rae, Alexander, Invergowrie, Dundee	1862
3040	Rae, William, Gateslack, Thornhill	1860
	Rainy, Dr Alexander, Hallforest, Kintore	1858
	Rainy, George, of Rasay, Broadford	1846
	Raid, D. C., Goldsmith, Glasgow	1838
	Rait, James, of Anniston, Arbroath	1854
	Ramsay, John, of Kildalton, Bowmore	1856
	Ramsay, Major John, of Barra, Aberdeen	1856
	Ramsay, Robert B. Wardlaw, of Whitehill Lasswade	1841
	Ramsay, Captain, Paxton House, Berwick	1854
	Ramsay, Maj.-Gen. W. Maule, Dalhousie Castle	1861
3050	Ramsay, Lt.-Col. Wm. Burnett, of Banchory Lodge	1841
	Ramsay, Rear-Admiral William, C.B., Edinburgh	1864

		Admitted
	Ranken, Bryce Macmurdo, Proc.-Fisc. of Orkney	1841
	Ranken, George, Australia	1839
	Ranken, Patrick, of Mavisbank, Glasgow	1844
	Ranken, Thomas, S.S.C., Edinburgh	1838
	Ranken, William, M.D., Glenlogan, Sorn	1836
	Rankine, John, of Lochlands, Maybole	1857
	Rankine, W. J. Macquorn, Professor of Civil Engineering, University of Glasgow, Consulting Engineer to the Society	1865
	Rannie, Henry A. Mill, of Boyndie, Banff	1859
3060	Rannie, Mordaunt Gordon, Edenmouth, Kelso	1859
	Rannie, Robert Walker, Inchyra, Perth	1827
	Rashleigh, William, of Menabilly, Fowey	1837
	Rattray, Lieut.-Col. J. C., of Craighall, Blairgowrie	1854
	Rawdin, Joseph, Chemist, Jedburgh	1856
	Ray, William, Sunbank, Elgin	1854
	Rea, Charles, Doddington, Wooler	1863
	Redfern, W. Macquarrie, London	1857
	Reed, Ellerington, Kilcalmkill, Golspie	1847
	Reed, Robert, Sidera, Golspie	1847
3070	Reekie, Andrew, Walton, Auchtertool, Fife	1864
	Reid, Alexander, Cruivie, Cupar	1857
	Reid, Benjamin L., Balcairn, Old Meldrum	1855
	Reid, Charles G., W.S.	1844
	Reid, George, Seedsman, Aberdeen	1858
	Reid, James, Ballencrieff, Drem	1855
	Reid, James, Cattle-Dealer, Biggar	1857
	Reid, James, Greystone, Alford	1858
	Reid, James, Donavourd, Dunkeld	1861
3080	Reid, John, Hilton of Aldie, Kinross	1859
	Reid, Patrick, Cattle-Dealer, Middleton, Gorebridge	1854
	Reid, Peter, Drumfork House, Helensburgh	1855
	Reid, Peter, Nether Kildrummy, Mossat	1858
	Reid, Walter, Drem	1850
	Reid, Walter, Park of Keir, Dunblane	1864
	Reid, William, of Hayston, Kirkintilloch	1857
	Rennie, James, Kessington, East Kilpatrick	1857
	Rennie, John, Curriemyre, Kilsyth	1863
	Renton, Archibald Campbell, of Lamberton, Berwick	1857
3090	Renton, John, M.D., Edinburgh	1859
	Reoch, John F., of Gilmerton, Edinburgh	1859
	Rhind, David, Architect, Edinburgh	1852
	Rhind, Macduff, Sheriff-Subs. of Wigtownshire	1843
	Richardson, David, of Hartfield, Glasgow	1863

		Admitted
	Richardson, Francis, Merchant, Edinburgh	1849
	Richardson, James, Merchant, Edinburgh	1833
	Richardson, James T. Stewart, yr. of Pitfour, Perth	1861
	Richardson, John, Writer, Haddington	1851
	Richardson, John, Drylawhill, Prestonkirk	1863
3100	Richardson, Robert, Merchant, Edinburgh	1837
	Richardson, Robert, Haddington	1859
	Richardson, Robert, Crailingnook, Jedburgh	1863
	Richardson, Maj.-Gen. Robertson, of Tullybelton, C.B.	1847
	Richardson, Thomas, of Ralston, Glasgow	1854
	Richmond, George, Lawhill, Auchterarder	1861
	Richmond, John, Dron, Perth	1861
	Richmond, Matthew, Cararie, Ballantrae	1857
	Rickman, Thomas	1831
	Riddell, David, Kilbowie, Duntocher	1863
3110	Riddell, Thomas, Oxnam Nook, Jedburgh	1854
	Riddell, Wm., Hundalee, Jedburgh	1852
	Riddell, William, Rink, Selkirk	1863
	Riddick, George, Greenhill-head, Lockerbie	1859
	Rigg, William, Banks, Kirkcudbright	1861
	Rintoul, Alex., Ladywell, Auchterarder	1861
	Rintoul, Charles, East Craigie, Cramond	1852
	Rintoul, David, Upper Cairnie, Forteviot	1861
	Ritchie, James, Edinburgh	1863
	Ritchie, John, Newbigging Mains, Carnwath	1857
3120	Ritchie, Robert, Civil Engineer, Edinburgh	1833
	Ritchie, Thomas, Forrest Mill, Clackmannan	1838
	Ritchie, William, Nether Liberton, Edinburgh	1853
	Ritchie, William, Plean Mill, Stirling	1852
	Ritchie, William, of Middleton, Gorebridge	1865
	Robb, James, Gorgie, Slateford	1849
	Robb, James, Edinburgh	1862
	Roberton, Andrew, Hoselawbank, Kelso	1863
	Roberton, James, Ladyrig, Kelso	1841
	Roberton, John, Harperton, Kelso	1854
3130	Roberton, John, junior, Harperton, Kelso	1863
	Roberton, Robert, Ladyrig, Kelso	1863
	Robertson, Alexander, W.S., London	1825
	Robertson, Alexander, Ardlaw, Rosehearty	1856
	Robertson, Alexander Inglis, Aultnaskiach	1839
	Robertson, Andrew, Balmoral	1832
	Robertson, Arthur John, Inverness	1840
	Robertson, Dr Charles, Auchtercairn, Gairloch	1860
	Robertson, Daniel, Friarton, Perth	1861

		Admitted
	Robertson, David, of Ladykirk, M.P., Berwick	1842
3140	Robertson, David, Aberdeen	1847
	Robertson, David, Cloag, Methven	1861
	Robertson, David Souter, of Whitehill, Edinburgh	1847
	Robertson, Donald, of Pencross, Edinburgh	1854
	Robertson, Duncan Graham, of Torrie, Callander	1864
	Robertson, Captain George A.	1817
	Robertson, George B., Whitekirk, Prestonkirk	1860
	Robertson, James, Banker, Glasgow	1857
	Robertson, James, Inverary	1836
	Robertson, James, Hall of Caldwell, Beith	1852
3150	Robertson, James, Denbrae, Cupar-Fife	1859
	Robertson, Jas. Stewart, of Edradynate, W.S., Edin.	1851
	Robertson, Captain John	1825
	Robertson, John, Banker, Huntly	1847
	Robertson, John, Australia	1855
	Robertson, John, of Gartloch, Glasgow	1856
	Robertson, John, Glenlyon House, Fortingal	1854
	Robertson, John, S.S.C., Edinburgh	1859
	Robertson, John, Banchor, Kingussie	1863
	Robertson, John, Old Blair, Blair-Athole	1864
3160	Robertson, John, Drynie Mains, North Kessock	1865
	Robertson, Lawrence, Royal Bank, Edinburgh	1828
	Robertson, Neil, Frenich, Aberfoyle	1857
	Robertson, Peter S., Trinity Nurseries, Edinburgh	1862
	Robertson, Stewart, of Dercullich, Logerait	1843
	Robertson, Stewart Souter, yr. of Whitehill, Edin.	1861
	Robertson, Wilfred Mason, of Gartloch, Moodiesburn	1859
	Robertson, William, of Kinlochmoidart, Strontian	1826
	Robertson, William, Erray, Tobermory	1856
	Robertson, William, Cuttlebrae, Fochabers	1857
3170	Robertson, William, V.S., Kelso	1863
	Robeson, Robert, Springwells, Coldstream	1863
	Robey, Robert, Engineer, Lincoln	1859
	Robinow, Adolph, Merchant, Leith	1851
	Robson, Charles, Lurdenlaw, Kelso	1841
	Robson, Charles, junior, Lurdenlaw, Kelso,	1863
	Robson, John, Byreness, Otterburn	1853
	Robson, Neil, C.E., Glasgow	1857
	Robson, William, Kilbreck, Lairg	1850
	Rodger, David, Penkiln, Garlieston	1851
3180	Rodger, George, Bridgelands, Selkirk	1861
	Rodger, Matthew, of Rossland, Glasgow	1854

		Admitted
	Rodger, Peter, Selkirk	1859
	Rodger, Robert, Hadlow Castle, Tunbridge	1838
	Rodger, Robert M., Factor, Airdrie House, Airdrie	1865
	Roger, Hugh, Attiquin, Maybole	1857
	Roger, William, Pitlour, Strathmiglo	1865
	Rogers, James S., Rose Mill, Dundee	1862
	Rogerson, George, Piersby Hall, Lockerbie	1851
	Rogerson, James, yr. of Wamphray, Lockerbie	1864
3190	Rogerson, William, of Gillesbie, Lockerbie	1829
	Rolland, Adam, of Gask	1837
	Ronaldson, Alexander, Glasgow	1857
	Romanes, Robert, of Harryburn, Lauder	1863
	Rome, R. M., Ruggetshaws, Langholm	1860
	Ronaldson, Alexander, Little Gight, Methlic	1863
	Rose, John N., of Holme, Nairn	1865
	Rose, Major James, of Kilravoch, Nairn	1865
	Rose, William, Fosterseat, Elgin	1854
	Ross, Alexander, Inchley, Banchory	1857
3200	Ross, Crawford, Cadboll, Tain	1857
	Ross, David, Banker, Dingwall	1864
	Ross, D. G., Seed-Merchant, Dingwall	1864
	Ross, George, of Pitcalnie, Parkhill	1839
	Ross, George, Tore Farm, Munlochy	1865
	Ross, Lieut.-Col. George W. H., of Cromarty	1849
	Ross, James, Newton-lees, Kelso	1863
	Ross, Major-General James K., K.H., Edinburgh	1839
	Ross, Harry, junior, Wester Coull, Tarland	1858
	Ross, John Leith, of Arnage, Ellon	1843
3210	Ross, Richard Louthian, of Staffold	1804
	Ross, Thomas, Bachilton, Perth	1856
	Ross, William, Greenside, Largo	1859
	Roughead, David, Seedsman, Haddington	1850
	Rowan, John Martin, Atlas Works, Glasgow	1857
	Rowand, Alexander, Glasgow	1844
	Rowat, Thomas, Currievale, Currie	1855
	Roy, Alexander, Waterton, Insch, Aberdeen	1856
	Roy, Frederick Lewis, of Nenthorn, Kelso	1837
	Roy, James, junior, Seedsman, Aberdeen	1840
3220	Roy, Robert, W.S., Chester	1822
	Royds, Robert Whyt	1856
	Ruddock, Joseph Willis, Tweed House, Berwick	1863
	Russell, Alexander James, W.S., Edinburgh	1846
	Russell, Andrew Walker, of Kenlygreen, Newburgh	1854

		Admitted
	Russell, David, Silverburn, Leven	1859
	Russell, Francis Whitworth	1835
	Russell, George E., Edinburgh	1858
	Russell, James, of Aden, Mintlaw	1834
	Russell, James, Edinburgh	1848
3230	Russell, James, Coalstoun Mains, Haddington	1851
	Russell, James, of Breckonside, Thornhill	1847
	Russell, John, Saughton Hall Mains, Slateford	1862
	Russell, Lewis, Conon, Dingwall	1864
	Russell, Robert, Edinburgh	1834
	Russell, Robert, Pilmuir, Leven	1851
	Rust, James, Paddock Law, Banff	1858
	Rutherford, George, Monteath's Houses, Gorebridge	1860
	Rutherford, George, of Scaurs, Jedburgh	1863
	Rutherford, George, Printonan, Coldstream	1863
3240	Rutherford, John, Eldinhope, Selkirk	1863
	Rutherford, John, Muirhall, Perth	1861
	Rutherford, Wm. Oliver, of Edgerston, Jedburgh	1825
	Rutherfurd, Wm. A. Oliver, yr. of Edgerston	1863
	Ruxton, Andrew, South Artrochie, Ellon	1854
	Ruxton, John, M.D., Hill of Fiddes, Hill of Menie	1851
	Ruxton, William, Farnell, Brechin	1850

	†SUTHERLAND, His Grace George, Duke of, K.G.	1849
	SUTHERLAND, Her Grace Harriet, Dowager Duchess of	1834
	STRATHMORE, The Right Hon. Thomas, Earl of	1852
3250	†SELKIRK, The Right Hon. Dunbar-James, Earl of	1830
	SOUTHESK, The Right Hon. James, Earl of	1850
	SEAFIELD, The Right Hon. John, Earl of	1842
	STAIR, The Right Hon. John, Earl of	1845
	SCOTT, The Right Hon. Lord Henry, M.P.	1861
	SCOTT, The Right Hon. Lord Walter	1861
	SCOTT, The Right Hon. Lord Charles	1864
	†STRATHALLAN, The Right Hon. William, Viscount	1847
	STORMONT, The Right Hon. William, Viscount	1861
	SALTOUN, The Right Hon. Alexander, Lord	1854
3260	SANDILANDS, The Hon. James, Barnton	1855
	SINCLAIR, Sir Robert Charles, of Stevenson, Bart.	1864
	STEWART, Sir M. R. Shaw, of Blackhall, Bart., M.P.	1848
	SCOTT, Sir William, of Ancrum, Bart., M.P.	1829
	STEWART, Sir Wm. Drummond, of Grandtully, Bart.	1839

		Admitted
	SETON, Sir William Coote, of Pitmedden, Bart.	1834
	SINCLAIR, Sir George, of Ulbster, Bart.	1812
	SUTTIE, Sir George Grant, of Balgone, Bart.	1839
	SINCLAIR, Sir John, of Dunbeath, Bart.	1824
	STEUART, Sir Henry M. Seton, of Allanton, Bart.	1835
3270	STEWART, Admiral Sir Houston, K.C.B.	1822
	Sadler, Daniel B., Balmuick, Crieff	1864
	Sadler, Thomas, Norton Mains, Ratho	1838
	Sadler, William, Ferrygate, Drem	1853
	Salmon, James, Benston, Johnstone	1858
	Salmon, John, Johnstone Castle, Johnstone	1856
	Salmond, Duncan, Rothsay	1846
	Salmond, James	1858
	Salmond, Robert, Banker, Glasgow	1845
	Sanderson, Capt. A. C., of Glenlaggan, Castle-Douglas	1844
3280	Sanderson, James, Manchester Buildings, Westminster	1854
	Sanderson, George B., Hatton Mains, Ratho	1858
	Sanderson, Wm., Corstorphine Bank, Corstorphine	1864
	Sands, William John, W.S., Edinburgh	1849
	Sangster, Robert B., Banker, Golspie	1845
	Scarth, James, Banker, Leeds	1820
	Scarth, Pillans, W.S., Leith	1862
	Scarth, Robert, of Binscarth, Kirkwall	1843
	Scobie, John, Lochinver, Golspie	1851
	Scoon, Kenneth, Braidwood, Gorebridge	1854
3290	Scott, Adam, Dalmore, Alness	1851
	Scott, Alexander, Beanston, Prestonkirk	1850
	Scott, Alexander, Hopetoun, South Queensferry	1860
	Scott, Andrew, Glendouglas, Jedburgh	1848
	Scott, Andrew, jun., W.S., Edinburgh	1861
	Scott, Cartaret G., of Malleny, Balerno	1842
	Scott, Charles, Palmerton, Cockburnspath	1857
	Scott, Charles, Corn Merchant, Arbroath	1859
	Scott, Charles C., of Hawkhill, Greenock	1831
	Scott, David	1823
3300	Scott, David, of Balnakettle, Fettercairn	1859
	Scott, David, Meadowfield, Duddingston, Edinburgh	1849
	Scott, Admiral George, of Wooden, Kelso	1844
	Scott, Lieutenant-Colonel George	1821
	Scott, George, Mosstower, Kelso	1863
	Scott, Gideon James, Singlee, Selkirk	1861
	Scott, Henry, Crosslee, Selkirk	1853
	Scott, Hercules, of Brotherton, Bervie	1859
	Scott, Hugh, of Gala, Galashiels	1846

		Admitted
	Scott, James, of Kelly, Glasgow	1850
3310	Scott, James, Easter Tullo, Stonehaven	1862
	Scott, James, Enzieholm, Langholm	1859
	Scott, James Fitzmaurice, of Commieston	1843
	Scott, Dr James Robson, of Ashtrees, Yetholm	1863
	Scott, James R. Hope, of Abbotsford, Melrose	1854
	Scott, John, Agrl. Commission Agent, Belford	1862
	Scott, John, Finnart House, Greenock	1826
	Scott, John, of Rodono, W.S., Edinburgh	1842
	Scott, John Scott Elliot, Buckholm, Galashiels	1863
	Scott, Peter Redford, of Redford Hill, Edinburgh	1860
3320	Scott, Captain Robert	1841
	Scott, Robert, Kinninghall, Hawick	1863
	Scott, Thomas, Broomhouse, Beal, Northumberland	1855
	Scott, Thomas, Easter Cadder, Kirkintilloch	1857
	Scott, Thomas, of Uddingston, Glasgow	1857
	Scott, Thomas, Whitton, Morebattle, Kelso	1863
	Scott, Thomas Rennie, Castle Mains, Douglas	1827
	Scott, Thomas Robson, of Newton, Jedburgh	1860
	Scott, Walter, Glendronach, Huntly	1850
	Scott, Walter, Edgerston Tofts, Jedburgh	1863
3330	Scott, William, Timpendean, Jedburgh	1857
	Scott, William J.	1853
	Scott, William, Wester Rora, Mintlaw	1855
	Scott, William, Mossilee, Galashiels	1855
	Scott, William, of Burnside, Alyth	1862
	Scott, William, Howford, Selkirk	1863
	Scott, William, North Leys, Banchory-Ternan	1857
	Scott, William Elliot, of Peel, Newcastleton	1863
	Scott, William Monteith, yr. of Ancrum, Jedburgh	1863
	Selby, Ephraim, Hassendean, Hawick	1863
3340	Sellar, Patrick Plenderleith, Morvich, Golspie	1849
	Sempill, Edward, Moreton-Pinckney, Banbury	1856
	Sempill, John	1857
	Semple, Thomas, Mull	1857
	Seton, Alexander, of Preston, Linlithgow	1854
	Seton, George, Advocate, Edinburgh	1848
	Seton, Henry, V.S., Edinburgh	1859
	Shand, Alexander Burns, Sheriff of Kincardineshire	1863
	Shand, John, W.S., Edinburgh	1844
	Shand, George, Stirling	1864
3350	Shand, William, Wolfstar, Ormiston	1864
	Sharp, Andrew, North Forr, Crieff	1861
	Sharp, Francis, Doverhall, Inverkeithing	1858

		Admitted
	Sharp, James	1846
	Shaw, Charles, W.S., Sheriff-Substitute, Lochmaddy	1835
	Shaw, David, W.S., Ayr	1836
	Shaw, Hary, Bogfairn, Tarland	1850
	Shaw, James, Skaithmuir, Coldstream	1863
	Shaw, Patrick, Advocate, Sheriff of Chancery	1835
	Shaw, Thomas, Foster, Glenisla, Alyth	1861
3360	Shaw, William, Finegaud, Glenshee, Blairgowrie	1861
	Shawe, R. F., of Bartinghame, Thorpe, Hull	1838
	Shennan, James, Balig, Kirkcudbright	1857
	Shepherd, George, Shethin, Tarves	1854
	Shepherd, Captain Thomas, of Kirkville, Skene	1858
	Shireff, Charles, Sheriff-Substitute, Dunfermline	1829
	Shireff, John Bell, Carronvale, Larbert	1864
	Shirreff, Charles H., Corn Factor, Edinburgh	1859
	Shirreff, Thomas, West Barns, Dunbar	1861
	Shirriff, David, Muirton, Drem	1847
3370	Shirriff, Samuel D., Saltcoats, Drem	1850
	Shortreed, Robert, Attonburn, Yetholm	1854
	Sidey, James, Pitcairngreen, Perth	1852
	Sim, Adam, of Culter Mains, Biggar	1836
	Sim, William, Edinburgh	1858
	Sime, William, Balgay, Inchture	1860
	Simpson, Alexander, Seafield, Inverness	1846
	Simpson, Alexander, Downduff, Forres	1855
	Simpson, Alex. Horatio, Hayes, Uxbridge	1830
	Simpson, Alexander, Clerk of Supply, Dumfries	1860
3380	Simpson, Alexander, Wallyford, Musselburgh	1860
	Simpson, George, Bedrule, Jedburgh	1853
	Simpson, James, Mawcarse, Kinross	1851
	Simpson, James Y., M.D., Professor of Midwifery, University of Edinburgh	1848
	Simpson, Richard, Haggerston, Beal, Northumberland	1863
	Simpson, Robert, of Cobairdy, Huntly	1839
	Simpson, Thomas H., Gortinlee, Lasswade	1855
	Simson, Charles, of Threepwood, Lauder	1850
	Simson, George, of Pitcorthie, Leven	1841
	Simson, George, Courthill, Kelso	1861
3390	Simson, Thomas, Blainslie, Lauder	1850
	Sinclair, Alexander, Edinburgh	1839
	Sinclair, Archibald, Glasgow	1859
	Sinclair, David, Loirston, Aberdeen	1863
	Sinclair, Dugald, Kilchamaig, Tarbert	1826
	Sinclair, James, of Forss, Thurso	1830

		Admitted
	Sinclair, James, Westmill, Inchture	1858
	Sinclair, John, of Lochaline, Morven	1834
	Sinclair, John, Borlum, Glen Urquhart	1856
	Sinclair, J. G. T., yr. of Ulbster, Thurso	1857
3400	Singer, Adam, Wardford, Methlic	1858
	Sivewright, James	1850
	Sinton, Thomas, Aberarder, Laggan	1863
	Skelton, George, of Invernettie Lodge, Peterhead	1837
	Skene, George, of Rubislaw, Aberdeen	1831
	Skene, Moncrieff, of Pitlour, Strathmiglo	1849
	Skene, William F., W.S., Edinburgh	1831
	Skinner, Captain C. G. M'Gregor, Belfast	1823
	Skinner, James, Drumin, Ballindalloch	1827
	Skinner, James, Woodside, Aberdeen	1859
3410	Skinner, John, Balwhimry, Markinch	1858
	Skirving, Adam, of Croys, Dalbeattie	1857
	Skirving, James, Luffness Mains, Drem	1850
	Skirving, Robert Scot, Camptoun, Drem	1846
	Sleigh, John, Land-Surveyor, Strichen	1858
	Slipper, Robert B., Stamford Hill, London	1863
	Sloan, David, Coach Builder, Dumfries	1861
	Small, David, Writer, Dundee	1843
	Small, James, of Dirnanean, Blairgowrie	1859
	Small, Lindsay, Bellevue, Coupar-Angus	1857
3420	Small, William, Merchant, Dundee	1843
	Smart, John, Glasgowego, Blackburn, Aberdeen	1858
	Smart, James, Liberton Park, Edinburgh	1864
	Smith, Adam, Stevenson Mains, Haddington	1857
	Smith, Alexander, Civil Engineer, Aberdeen	1847
	Smith, Alexander (A. &. W. Smith & Co.), Glasgow	1852
	Smith, Alexander, Letham, Berwick	1863
	Smith, Alexander P., Munlochy Farm, Munlochy	1864
	Smith, Andrew, Willowbrae House, Edinburgh	1862
	Smith, Andrew, Blackwood, Lesmahagow	1856
3430	Smith, Andrew, Solicitor, Dingwall	1864
	Smith, Archibald, Sheriff-Substitute, Glasgow	1838
	Smith, Charles, Whittingham, Prestonkirk	1853
	Smith, Charles Hope Johnstone, Garden Architect	1836
	Smith, David, W.S., Edinburgh	1833
	Smith, David, Easter Ballindean, Inchture	1862
	Smith, E. B., of Blackwood House, Ecclefechan	1839
	Smith, Frederick Charles, Hoprig, Cockburnspath	1864
	Smith, George, Minmore, Ballindalloch	1839
	Smith, George Campbell, Australia	1837

		Admitted
3440	Smith, George, Glasgow	1862
	Smith, Major Hope, of Cruicksfield, Dunse	1853
	Smith, Hugh (Smith Brothers & Co.), Glasgow	1857
	Smith, James, of Jordanhill, Glasgow	1823
	Smith, James, Lawhill, Auchterarder	1855
	Smith, James, of Olrig, Thurso	1855
	Smith, James, Phoine, Campbeltown	1857
	Smith, James, New Prestwick, Ayr	1857
	Smith, James, Edinburgh	1857
	Smith, James, Glasgow	1859
3450	Smith, John, Advocate, Aberdeen	1851
	Smith, John, Ballochantay, Campbeltown	1857
	Smith, John, Coynachie, Gartly	1858
	Smith, John, Writer, Irvine	1858
	Smith, John Gordon, Nevie, Ballindalloch	1852
	Smith, John T., Goswick, Berwick-on-Tweed	1854
	Smith, Richard, Wester Rossland, Bishopton	1864
	Smith, Robert, S.S.C., Edinburgh	1839
	Smith, Robert, Ladyland, Dumfries	1850
	Smith, Robert, Kersquarter, Kelso	1854
3460	Smith, Robert, Hayford Mills, Stirling	1864
	Smith, R. M., Merchant, Leith	1854
	Smith, Thomas, Dalfibble, Dumfries	1850
	Smith, William, Kirknewton	1823
	Smith, William, Cattle Salesman, Edinburgh	1854
	Smith, William, East Learmonth, Coldstream	1854
	Smith, William, West Drums, Brechin	1856
	Smith, William, Line, Ballindalloch	1857
	Smith, William, Hillfold, Monymusk	1858
	Smith, William, Banker, Moniaive	1860
3470	Smith, William, Stone of Morphie, Montrose	1863
	Smollett, Alexander, of Bonhill, Dumbarton	1826
	Smyth, Alexander, Drumduan, Forres	1855
	Smythe, William, of Methven, Perth	1846
	Snodgrass, Allan, Mollanda, Cardross	1857
	Snowdowne, James, Longriggs, Tillicoultry	1858
	Somervail, Peter, Glendevon, Linlithgow	1857
	Somervell, Graham, of Sorn, Mauchline	1857
	Somerville, James, Merchant, Glasgow	1838
	Somerville, James, Ladyurd, Noblehouse	1848
3480	Somerville, James, of Bridgend, S.S.C., Edinburgh	1858
	Somerville, James, North Kinkell, Auchterarder	1862
	Somerville, John, Dovecot, Leadburn	1859
	Somerville, Samuel, of Ampherlaw, M.D., Edinburgh	1841

		Admitted
	Somerville, S. H. M., of Broadfield, Port Glasgow	1845
	Somerville, Thomas, of Greenfield, Edinburgh	1845
	Somerville, William, Merchant, Glasgow	1850
	Sorley, John, Thornhill, Blairdrummond	1861
	Souter, Alexander, Banff	1854
	Speid, James, of Forneth, Brechin	1843
3490	Speir, Robert, Blair Park, Dalry, Ayrshire	1858
	Speir, Thomas, of Blackston, Paisley	1838
	Speirs, Thomas Dundas, Burnfoot, Houston	1838
	Spence, Adam White, Merchant, Leith	1860
	Spens, Archibald, of Lithallan, Falkirk	1861
	Spens, Nathaniel, of Craigsanquhar, Cupar-Fife	1848
	Spens, William, Glasgow	1845
	Spottiswoode, John, of Spottiswoode, Lauder	1812
	Spowart, Thomas, of Broomhead, Dunfermline	1863
	Sprot, James, of Spot, Dunbar	1830
3500	Sprot, John, Ayr	1830
	Sprot, Mark, of Garnkirk, Glasgow	1820
	Sprot, Mark, of Riddell, Lilliesleaf	1830
	Sprot, Thomas, W.S., Edinburgh	1826
	Stables, William Alexander, Cawdor Castle, Nairn	1836
	Starforth, John, Architect, Edinburgh	1854
	Stark, Andrew, Hill of Beath, Crossgates	1858
	Stark, Ralph, Camelon, Falkirk	1862
	Stark, Thomas, Mellendean, Kelso	1863
	Stark, William, Contentibus, Mid-Calder	1861
3510	Stedman, James, Wester Ulston, Jedburgh	1851
	Steedman, James, Boghall, Roslin	1847
	Steedman, John, Charleston, Dunfermline	1862
	Steel, Christopher, Auchenfranco, Dumfries	1860
	Steel, William Bowden, Annathill, Airdrie	1858
	Steele, Robert, Greenock	1853
	Steele, William, Sheriff-Substitute of Dumbarton	1828
	Stegmann, Conrad, Merchant, Leith	1854
	Stenhouse, George, West Pilton, Blackhall	1850
	Stenhouse, James, Southfield, Corstorphine	1850
3520	Stenhouse, James, yr. of Northfod, Cowden Beath	1852
	Stenhouse, James, Myles, Tranent	1861
	Stephen, James, Conglass, Keith Hall	1858
	Stephen, William, Inchbroom, Elgin	1853
	Stephens, Henry, Redbrae Cottage, Edinburgh	1826
	Steuart, Andrew, of Auchluncart, Keith	1845
	Steuart, Archibald Seton, Alloa	1835
	Steuart, David, of Steuart Hall, Stirling	1857

		Admitted
	Steuart, James, W.S., Edinburgh	1842
	Steuart, James, junior, Edinburgh	1864
3530	Steuart, John, Pollockshaws	1857
	Steuart, Patrick, Middlegill, Moffat	1859
	Steuart, Robert, of Carfin, Edinburgh	1833
	Steuart, Robert, yr. of Carfin, Edinburgh	1864
	Steuart, Robert, of Murdieston, Glasgow	1844
	Steuart, Robert, Brownlee, Carluke	1855
	Steuart, William, London	1833
	Stevens, Moses, of Bellahouston, Glasgow	1832
	Stevenson, Alexander, Banker, Langholm,	1839
	Stevenson, Alexander, Kirkside, Banff	1858
3540	Stevenson, Andrew, Duncanlaw, Gifford	1855
	Stevenson, Charles, Edinburgh	1850
	Stevenson, David, C.E., Edinburgh	1853
	Stevenson, Duncan, Edinburgh	1824
	Stevenson, John, Oban	1842
	Stevenson, John B., New Zealand	1853
	Stevenson, John, Hillhead, Sorn, Mauchline	1864
	Stevenson, Robert, Banker, Edinburgh	1860
	Stevenson, Thomas, Mount-Lothian, Penicuick	1852
	Stewart, Alexander, Tempar, Kinloch Rannoch	1860
3550	Stewart, Alexander J., W.S., Edinburgh	1858
	Stewart, Alexander, Craigenseat, Huntly	1862
	Stewart, Andrew, Auctioneer, Dumfries	1860
	Stewart, Archibald, Inspector-General of Army Hospitals, Craigruie, Balquhidder	1865
	Stewart, Captain Boxer, of Urrard, Blair-Athole	1858
	Stewart, Charles, Aberfeldy	1834
	Stewart, Charles, of Hillside, Lockerbie	1823
	Stewart, Charles, Solicitor, Inverness	1840
	Stewart, Charles, Bank Agent, Killin	1858
	Stewart, David, London	1842
3560	Stewart, David, Kippenross, Dumblane	1862
	Stewart, Donald, Clachan, Blair-Athole	1859
	Stewart, Lieutenant Duncan, R.N.	1863
	Stewart, George, Kirkchrist, Kirkcudbright	1844
	Stewart, Henry, of St Fort, Newport	1837
	Stewart, Henry Black, of Balnakeilly, Pitlochry	1838
	Stewart, H. G. Murray, of Broughton, Gatehouse	1857
	Stewart, James, Pitskelly, St Martins, Perth	1851
	Stewart, James, New Market, Aberdeen	1854
	Stewart, James, Factor, Irvine	1858
3570	Stewart, James, Ballyorgan, Ardrishaig	1857

		Admitted
	Stewart, John, London	1819
	Stewart, John, of Dalguise, Dunkeld	1823
	Stewart, John, M.D., R.N., of Findynate, Logierait	1839
	Stewart, John, of Nateby Hall, Lancashire	1851
	Stewart, John, Strathaven	1854
	Stewart, John, Upper Ardroscadale, Rothesay	1855
	Stewart, John, Floddigary, Portree	1858
	Stewart, John Lorn, of Coll, Campbeltown	1824
	Stewart, John Archibald Shaw, London	1853
3580	Stewart, Malcolm, Fife Keith, Keith	1862
	Stewart, Mark S., of Southwick, Dumfries	1837
	Stewart, Neil P., Biallid, Kingussie	1863
	Stewart, Osmond de Haviland, Waterhead, Lockerbie	1859
	Stewart, Peter, Cowburn, Lockerbie	1860
	Stewart, Robert, of Ballechin, Dunkeld	1854
	Stewart, Robert, of Ingliston, Kirkliston	1858
	Stewart, Robert Balfour, yr. of St Fort, Newport	1859
	Stewart, Robert Hawthorn Johnstone, of Straiton	1846
	Stewart, Samuel, Sandhole, Strichen	1857
3590	Stewart, Stair Hawthorn, of Physgill, Whithorn	1828
	Stewart, Thomas, Gillenbie, Lockerbie	1859
	Stewart, Walter, Mains of Kynachan, Pitlochry	1859
	Stewart, William, Ballaterach, Ballater	1829
	Stewart, William, of Blackhouse, Largs	1844
	Stewart, William, Tonroich, Campbeltown	1850
	Stewart, William, Pininver, Campbeltown	1857
	Stewart, William, Saddler, Aberfeldy	1860
	Stirling, Gilbert, 9th Lancers, Larbert, Falkirk	1864
	Stirling, Major Graham, of Craigbarnet, Strathblane	1857
3600	Stirling, James, C.E., Edinburgh	1852
	Stirling, John, of Kippendavie, Dunblane	1833
	Stirling, Captain John, of Gargunnock, Stirling	1865
	Stirling, Thomas Graham, of Strowan, Crieff	1839
	Stirling, William, of Keir, M.P., Dunblane	1841
	Stirling, William, of Tarduff, Linlithgow	1855
	Stobie, Thomas, Balneathill, Kinross	1851
	Stobo, Robert, of Hallidayhill, Auldgirth Bridge	1860
	Stodart, Archibald, Covington, Biggar	1855
	Stodart, David, Jerviswood Mains, Lanark	1855
3610	Stodart, George Tweedie, of Oliver, W.S., Edin.	1839
	Stodart, James, Walston, Carnwath	1855
	Stodart, James, Drummelzier, Rachan Mill	1855
	Stodart, James, Boreland, Lockerbie	1864
	Stodart, John, Bangour, Uphall	1851

		Admitted
	Stodart, William, Wintonhill, Tranent	1855
	Storrar, James, V.S., The Palace, Dubford, Banff	1859
	Storrie, Francis, V.S., East Linton	1850
	Stott, Gibson, London	1832
	Stott, John, of Netherwood, Dumfries	1855
3620	Stott, Joseph Hood, Edinburgh	1859
	Strachan, James, Wester Fowlis, Alford	1858
	Strachan, Lewis, Cluny of Raemoir, Banchory	1858
	Strang, John, High Crewburn, Strathaven	1857
	Straton, George Thomas, of Kirkside, Montrose	1842
	Strong, Thomas, W.S., Edinburgh	1859
	Struthers, Dr John, Prof. of Anatomy, Aberdeen	1859
	Stuart, Alexander C., of Eaglescairnie, Haddington	1863
	Stuart, Alexander, of Inchbreck, Kincardineshire	1865
	Stuart, Captain John	1809
3630	Stuart, David, Huntingtower, Perth	1861
	Stuart, Gilbert, Runningburn, Stitchel, Kelso	1863
	Stuart, Samuel M'Dowall, Glasgow	1845
	Sturrock, John, Banker, Dundee	1843
	Sutherland, Eric, Rosevally, Elgin	1853
	Sutherland, George, of Forse, Lybster	1849
	Sutherland, Joseph, Shiness, Lairg	1856
	Sutherland, Niel, Kilbagie, Kincardine-on-Forth	1864
	Sutherland, Robert, Shiness, Lairg	1856
	Sutherland, Sinclair, Milton, Culduthel, Inverness	1852
8640	Suttie, James, Shotover Park, Oxford	1855
	Swan, James, Live Stock Agent, Edinburgh	1858
	Swan, John, Cattle Salesman, Edinburgh	1851
	Swan, Robert, Writer, Kelso	1852
	Swan, Samuel, Overton, Bush, Jedburgh	1863
	Swan, Thomas, Live Stock Agent, Edinburgh	1858
	Swann, James, Collierhall, Douglas	1861
	Swann, J. R., Leith Walk, Edinburgh	1859
	Swinburne, Capt., R.N., of Eilan Shona, Greenock	1857
	Swinton, Arch. Campbell, yr. of Kimmerghame	1841
3650	Swinton, John Campbell, of Kimmerghame, Dunse	1810
	Swinton, Peter Burn, Holyn Bank, Gifford	1862
	Sydserff, Thomas Buchan, of Ruchlaw, Prestonkirk	1853
	Syme, George, Couston, Aberdour	1859
	Syme, James, Professor of Clinical Surgery, University of Edinburgh	1838
	Syme, William, Craigie, Leuchars	1857
	Symington, Thomas	1848

		Admitted
	†TWEEDDALE, Most Noble George, Marquis of, K.T.	1809
	TORPHICHEN, The Right Hon. Robert, Lord	1831
	THRIEPLAND, Sir Patrick Murray, of Fingask, Bart.	1824
3660	Tait, Alexander D., of Milrig, Galston	1845
	Tait, George, Advocate, Edinburgh	1808
	Tait, James, Banker, Kelso	1846
	Tait, James, Smailholm Mains, Kelso	1858
	Tait, John, Sheriff of Kinross and Clackmannan	1834
	Tait, John, Langrig, Whitsome	1861
	Tait, Joseph, Lindean, Selkirk	1863
	Tait, Joseph, Brankanentham, Portsoy	1852
	Tait, Robert, Leesmill, Coldstream	1863
	Tait, William, Vencheon, Kelso	1863
3670	Tait, William Reid, Heathfield, Thurso	1862
	Tawse, John, W.S., Edinburgh	1862
	Tawse, John Wardrope, W.S., Edinburgh	1859
	Tayler, William James, of Glenbarry, Rothiemay	1858
	Taylor, Alexander, Hillhouse, Lauder	1863
	Taylor, George, of Kirtonhill, Montrose	1858
	Taylor, John B., Seton West Mains, Prestonpans	1858
	Taylor, Malcolm, Ardnadam, Dunoon	1853
	Taylor, John, Redcastle, Chance Inn	1861
	Taylor, Robert, Laggan, Campbeltown	1857
3680	Taylor, Robert, Dumfrenny, Banchory	1857
	Taylor, William, Scotstown Park, South Queensferry	1828
	Templeton, Robert, Rannachan, Campbeltown	1857
	Tennant, Charles, of the Glen, Peebles	1853
	Tennant, Charles J., St Rollox, Glasgow	1838
	Tennant, John, St Rollox, Glasgow	1833
	Tennant, Robert, of Tranent	1863
	Thallon, Robert, Devon, Kennoway	1859
	Thew, Edward, Shortridge House, Alnwick	1855
	Thom, David, Merchant, Leith	1864
3690	Thom, James C., Quethillhead, Durris, Aberdeen	1858
	Thomas, James, Forthar, Kettle	1855
	Thomas, Robert, Manure Manufacturer, Newtyle	1861
	Thompson, Andrew, Berwick-on-Tweed	1845
	Thompson, John, Paston, Coldstream	1856
	Thoms, Alexander, of Rumgally, Cupar-Fife	1842
	Thoms, Patrick Hunter, of Aberlemno, Dundee	1861
	Thomson, Alexander, of Banchory, Aberdeen	1821
	Thomson, Alexander, Banker, Greenock	1825
	Thomson, Alexander, Bar. Haugh of Urr	1858
3700	Thomson, Alexander, W.S.	1838

		Admitted
	Thomson, George, of Burnhouse, Stow	1836
	Thomson, George	1854
	Thomson, George, Hopton, Jedburgh	1863
	Thomson, James, Papple, Haddington	1828
	Thomson, James, Mungoswells, Dunse	1855
	Thomson, James, Linton Cottage, West Linton	1858
	Thomson, James, of Acrehead, Dumfries	1861
	Thomson, John Anstruther, of Charleton, Colinsburgh	1848
	Thomson, Peter, Cowcoch, Abergele, North Wales	1859
3710	Thomson, Robert, Seggie, Guard Bridge	1857
	Thomson, Robert, Nether Cassock, Langholm	1859
	Thomson, R. J., Grange, Kilmarnock	1864
	Thomson, Samuel, Blaiket, Crocketford, Dumfries	1859
	Thomson, Thomas, Merchant, Glasgow	1850
	Thomson, William Thomas, Edinburgh	1841
	Thomson, William, of Balgowan, Perth	1844
	Thomson, William, Grain-Merchant, Edinburgh	1854
	Thomson, William (Hill & Thomson), Edinburgh	1860
	Thomson, William, Burnbank, Blair Drummond	1861
3720	Thorburn, David, Calgary, Tobermory	1859
	Thorburn, Walter, Banker, Peebles	1864
	Threshie, David Scott, W.S.	1824
	Thynne, William, Hoprig Mains, Tranent	1859
	Timins, William, of Hillfield, Stanmore, Middlesex	1844
	Tindal, James, Stonehaven	1849
	Tod, Alexander, Aitkendean, Carrington, Lasswade	1859
	Tod, Alexander, Gorgie Mains, Slateford	1854
	Tod, George, Lochran, Blair-Adam	1851
	Tod, Peter, of Meikleholmside, Moffat	1829
3730	Tod, Robert, Cardrona Mains, Peebles	1853
	Tod, Captain R. A. Boothby, of Howden, Mid-Calder	1864
	Tod, Thomas, of Drygrange, Melrose	1863
	Tod, William, Gospetrie, Kinross	1851
	Tod, William, Cattle Agent, Edinburgh	1851
	Tod, William, Edinburgh	1852
	Tod, William, of Hilton, Cupar	1857
	Tod, William, of Ayton, Bridge of Earn	1862
	Tod, William, Glenree, Lamlash, Arran	1864
	Todd, The Rev. Andrew, D.D., Alvah, Banff	1858
3740	Todd, James, Dunure Mains, Ayr	1858
	Todd, James, Castle Mains, Dirleton	1865
	Todd, John, of Finnich, Dumbarton	1838
	Todd, John, Valuator, Perth	1861
	Tolmie, Alexander, Ballisparden, Ardersier	1865

		Admitted
	Torrance, George M'Micken, of Threave, Edinburgh	1827
	Torrance, George, Sisterpath, Dunse	1863
	Torrance, Thomas, Whitsome Laws, Chirnside	1863
	Torrance, William, Hyvotsbank, Liberton	1831
	Townsend, Joseph, Glasgow	1859
3750	Trail, Dr J. R., Tombeg, Monymusk	1858
	Traill, George, of Ratter, M.P., Dunnet	1822
	Traill, William, of Woodwick, Orkney	1821
	Traquair, Ramsay H., Colinton	1846
	Trench, Henry, of Cangort Park, Shinrone, Ireland	1857
	Trotter, Archibald, of Castlelaw, Edinburgh	1845
	Trotter, Charles, of Woodhill, Blairgowrie	1841
	Trotter, George, Rosshill, Queensferry	1860
	Trotter, John P., Sheriff-Substitute, Dumfries	1831
	Trotter, Richard, of Morton Hall, Liberton	1836
3760	Trotter, Henry, yr. of Morton Hall, Liberton	1865
	Trotter, Robert Knox, of Ballindean	1829
	Tudhope, George, Colinhill, Strathaven	1850
	Tullis, Robert, of Grange, St Andrews	1861
	Turnbull, Alexander, Houndalee, Morpeth	1844
	Turnbull, Archibald, of Bellwood, Perth	1826
	Turnbull, Gregor, Merchant, Glasgow	1857
	Turnbull, George, Seedsman, Hawick	1863
	Turnbull, James, Lempitlaw, Eastfield, Kelso	1863
	Turnbull, John, Dunse	1855
3770	Turnbull John, of Abbey St Bathans, W.S., Edin.	1844
	Turnbull John, East Middle, Hawick	1863
	Turnbull, John, Kirk Mains, Kelso	1863
	Turnbull, Joseph, Bonhill Place, Dumbarton	1838
	Turnbull, Mark, Melrose Mills, Melrose	1862
	Turnbull, Phipps, Windsor Villa, Edinburgh	1841
	Turnbull, Phipps, junior, Little Pinkerton, Dunbar	1859
	Turnbull, Robert L., Falnash, Hawick	1854
	Turnbull, Stewart, Bonhill Place, Dumbarton	1850
	Turnbull, William, Falnash, Hawick	1856
3780	Turnbull, William, Graden, Kelso	1863
	Turnbull, William George, Spittal, Cavers	1863
	Turner, Angus, Pitcairns, Bridge of Earn	1844
	Turner, Duncan, Corachaine, Dunoon	1853
	Turner, Fred. J., The Dean, Kilmarnock	1859
	Turner, John, of Turner Hall, Ellon	1853
	Turner, Richard, Broompark, Mid-Calder	1855
	Turner, Thomas, Pirniefield Place, Leith	1855
	Turner, William, Gavinburn, Old Kilpatrick	1863

		Admitted
	Tweedie, Alexander, Coats, Haddington	1859
3790	Tweedie, David, Castle Crawford, Abington	1853
	Tweedie, James, of Quarter, Rachan House, Peebles	1860
	Tweedie, James, Deuchrie, Prestonkirk	1863
	Tytler, James Stuart, of Woodhouselee, W.S., Edin.	1863
	Tytler, Charles E. Fraser, of Sanquhar, Forres	1864
	Tytler, William Fraser, of Aldourie, Inverness	1860
	Umphray, Andrew, of Reawick, Shetland	1864
	Urquhart, B. C., of Meldrum and Blyth	1864
	Urquhart, John Grubb, of Vellore, Linlithgow	1858
	Urquhart, William Pollard, of Craigston, M.P.	1851
3800	Ure, William, Crawfordston, Kippen	1864
	Usher, John, Stodrig, Kelso	1853
	Vallance, Hugh, Greathill, Strathaven	1857
	Vallentine, James, Arnhall, Brechin	1850
	Vallentine, John, Nether Afflock, Skene	1858
	Vassall, Colonel Rawdon, Culdees Castle, Muthil	1860
	Veitch, Christopher, Bridgend, Linlithgow	1853
	Veitch, Christopher, Wheatlands, Cramond	1864
	Veitch, James, of Eliock, Sanquhar	1822
	Vere, Charles E. Hope, Ledard, Aberfoyle	1856
3810	Vere, W. E. Hope, of Craigiehall, Edinburgh	1846
	Vernor, James A., Hillhead, Musselburgh	1829
	†Wemyss, The Right Hon. Francis, Earl of	1819
	†Willoughby D'Eresby and Gwyder, The Right Honourable Peter, Lord	1868
	Wharncliffe, The Right Hon. Edward, Lord	1863
	Walpole, The Honourable Henry, Wolterton Park	1845
	Wauchope, Sir John Don, of Edmonstone, Bart.	1842
	Waddell, William, of Easter Moffat, W.S., Edinburgh	1818
	Wade, Major Carruthers, Edinburgh	1865
	Wakefield, J. Collen, Eastwood Park, Thornliebank	1857
3820	Wakelin, John, Old Mills, Musselburgh	1857
	Waldie, James, Millisle, Garlieston	1855
	Waldie, John, of Henderside Park, Kelso	1826
	Walker, Alexander, Brightmony, Nairn	1855
	Walker, A. R., Kintore	1854
	Walker, Bethune James, of Fallfield, Largo	1835

		Admitted
	Walker, Charles, Drumblair, Huntly	1847
	Walker, Fountaine, of Foyers, Inverness	1861
	Walker, Francis, Craignetherty, Turriff	1857
	Walker, Francis, Nisbet Mill, Kelso	1863
3830	Walker, Major George G., of Crawfordton, Dumfries	1858
	Walker, G. J., Hillside House, Portlethen, Aberdeen	1863
	Walker, Henry West, Banker, Auchtermuchty	1861
	Walker, James, of Dalry, Edinburgh	1860
	Walker, James, of Blairton	1847
	Walker, James, Kilpunt, Broxburn	1854
	Walker, James, Cawder Cuilt, Maryhill	1857
	Walker, J. W., Glenesk, Dalkeith	1856
	Walker, John, W.S., Edinburgh	1848
	Walker, John, Eastfield, Springburn	1857
3840	Walker, John Ewing, Cawder Cuilt, Maryhill	1857
	Walker, John, Maryfield, Bressay, Shetland	1862
	Walker, John, of Ardpeaton, Craigrownie, Roseneath	1865
	Walker, Matthew, Glasgow	1844
	Walker, Robert, Lathamhill, Glasgow	1844
	Walker, Rt., Hillside House, Portlethen, Aberdeen	1847
	Walker, Robert, Montbletton, Banff	1853
	Walker, Robert, Leuchars House, Elgin	1854
	Walker, Robert, Altyre, Forres	1859
	Walker, Robert, Gannochy, Perth	1861
3850	Walker, Thomas, Winthank, St Andrews	1861
	Walker, Walter, Balrymount, St Andrews	1859
	Walker, William, Wholeflatts, Grangemouth	1854
	Walker, William, Ardhunckart, Mossat	1858
	Walker, William, Torbrex, Stirling	1864
	Walker, William, Kintrae, Elgin	1864
	Walker, William S., of Bowland, Stow	1835
	Wallace, David, Balgrummo, Leven	1852
	Wallace, James, Brake, Denino, Fife	1861
	Wallace, John, Illieston, Broxburn	1861
3860	Wallace, Robert A., Lochryan, Stranraer	1857
	Wallace, William, of Auchinvole, Kilsyth	1844
	Wallace, William, Drumlemble, Campbeltown	1857
	Wallett, Thomas, Auctioneer, Castle-Douglas	1864
	Wardlaw, Major James, Belmaduthy, Munlochy	1856
	Warnock, Andrew, Bearyards, Bishopbriggs	1857
	Warrack, William, Newmill of Fintray, Aberdeen	1862
	Warrender, George, yr. of Lochend	1858
	Warwick, William, Glencartholm, Canonbie	1859
	Wason, Rigby, of Corwar, Barrhill	1836

		Admitted
3870	Waterston, Charles, Banker, Inverness	1839
	Watherston, John, Builder, Edinburgh, Master of Works to the Society	1861
	Watson, Crawford, Netherton of Logie, Peterhead	1855
	Watson, Douglas	1859
	Watson, George, Dalkeith Park	1854
	Watson, George, of Norton, Edinburgh	1848
	Watson, Henry, Lingerwood, Lasswade	1858
	Watson, Henry George, C.A., Edinburgh	1841
	Watson, Hugh, The Den of Kinnoul, Perth	1828
	Watson, John, junior, Over Johnston, Motherwell	1857
3880	Watson, John, Mumrills, Falkirk	1857
	Watson, John, Culterallers, Biggar	1864
	Watson, Thomas, Eperston, Gorebridge	1852
	Watson, William, of Bucklands, Hawick,	1841
	Watson, William, The Binns, Dundee	1852
	Watson, William, Engineer, Errol	1861
	Watson, William Scott, of Burnhead, Hawick	1863
	Watt, Gordon, Hirn, Banchory	1858
	Watt, James, Biggar	1856
	Watt, James, Balberton, Kirkcaldy	1864
3890	Watt, Wm. W. Graham, yr. of Skale, Stromness	1858
	Wauchope, Andrew, of Niddry Marischall, Liberton	1840
	Waugh, John, of St John's Kirk, Biggar	1857
	Webster, Andrew, of Rutherford, Edinburgh	1861
	Webster, James, S.S.C., Edinburgh	1853
	Webster, James, Hamilton	1853
	Webster, John, Advocate, Aberdeen	1858
	Webster, John, Thankerton, Holytown	1839
	Webster, John, New Horndean, Berwick	1863
	Webster, Robert, Blairquhosh, Strathblane	1856
3900	Webster, William, Daill, Islay	1838
	Weddell, John [illegible]kie, Lauder Barns, Lauder	1863
	Wedderburn, F. L. S., of Wedderburn, Cupar	1844
	Weir, Robert, Brownhill, Carnwath	1864
	Wells, William, of Holmewood, Stilton	1859
	Welsh, Alexander, Spott, Dunbar	1850
	Welsh, David, Tillytoghills, Brechin	1855
	Welsh, John, Kirkton, Hawick	1860
	Welsh, Thomas, of Earlshaugh, Ericstane, Moffat	1853
	Welwood, Alan A. Maconochie, of Garvoch	1842
3910	Wemyss, David Sinclair, of Southdun, Wick	1846
	Wemyss, James, of Wemyss Hall, Cupar-Fife	1841
	Wetherell, William, Aldbrough, Darlington	1836

		Admitted
	Whitaker, John, of Kelton, Dumfries	1860
	White, Alexander, Merchant, Leith	1829
	White, Alexander, Causeway Bank, Chirnside	1863
	White, Henry W., of Monar, Inverness	1842
	White, James, Edinburgh	1842
	White, James, Stockbroker, Edinburgh	1862
	White, James, of Overton, Dumbarton	1863
3920	White, James, of Drummelzier, Noblehouse	1842
	White, John, of Grougar, Kilmarnock	1863
	White, Peter, Accountant, Glasgow	1838
	White, Robert, W.S., Edinburgh	1842
	White, Samuel, Ludgate, Stow	1859
	White, William, Merchant, Glasgow	1838
	White, William, of Dykehead, Carnwath	1854
	White, William Logan, of Keillerstain, Hermiston	1856
	Whitehead, Joseph, of Kilnside, Paisley	1845
	Whitelaw, Alexander, Gartsherrie House, Gartsherrie	1859
3930	Whittet, George, Whitehouse, Cramond	1850
	Whitton, Andrew, of Couston, Newtyle	1861
	Whyte, Francis, M.D., Perth	1861
	Whyte, George, of Meethill, Peterhead	1851
	Whyte, John, Ballochoyle, Dunoon	1853
	Whyte, Rev. Robert, Dryfesdale, Lockerbie	1860
	Wight, George, Crookston Mains, Heriot, Edinburgh	1865
	Wight, Thomas, Wire-Worker, Perth	1861
	Wightman, James Seton, of Courance, Lockerbie	1827
	Wilkie, Andrew, Banker, Leven	1860
3940	Wilkie, Duncan, of Auchlishie, Kirriemuir	1843
	Wilkie, George, Cowdenlaws, Dysart	1857
	Wilkie, James, C. A., Edinburgh	1863
	Wilkie, John, of Foulden, Berwick	1830
	Wilkin, Thomas, Tinwald Downs, Dumfries	1862
	Willbank, Jonas, Keighley, Yorkshire	1854
	Williamson, Andrew F., Caskieben, Blackburn	1858
	Williamson, Alexander B. K., of Cardrona, Peebles	1863
	Williamson, David Robertson, of Lawers, Crieff	1861
	Williamson, Donald, Banker, Tain	1847
3950	Williamson, George, Shempston, Elgin	1850
	Williamson, James, Newtown of Mountblairy, Banff	1853
	Williamson, James, of Banniskirk, Thurso	1857
	Williamson, John W., of Eastgreen, Kinross	1829
	Willis, Thomas, Manor House, Bedale	1854
	Willison, James P., Dalpeddar, Sanquhar	1857
	Willison, John, Parish Holm, Douglas	1858

		Admitted
	Wilson, Adam, Auchengownie, Forgandenny	1861
	Wilson, Adam, Midshiels, Hawick	1861
	Wilson, Alexander, Kilnhilloch, Cullen	1842
3960	Wilson, Alexander, Fetterletter, Fyvie	1854
	Wilson, Alexander, Crosskill, Campbeltown	1857
	Wilson, Alexander, Alford House, Dunblane	1864
	Wilson, Alexander, yr. of Skeoch, Bannockburn	1864
	Wilson, Andrew, Waterside of Forbes, Aberdeen	1850
	Wilson, Edward L., Manufacturer, Bannockburn	1864
	Wilson, George, Dalmarnock, Glasgow	1847
	Wilson, George, Harelaw, Ayton	1859
	Wilson, George, Mills of Drum, Banchory	1857
	Wilson, George, Hawick	1863
3970	Wilson, Jacob, Manor House, Woodhorn, Morpeth	1859
	Wilson, James, Campbeltown	1857
	Wilson, James, Banker, Inverness	1840
	Wilson, James, Glasgow	1844
	Wilson, James, Wester Cowden, Dalkeith	1848
	Wilson, James, Burnetland, Biggar	1854
	Wilson, James, Old Mill, New Cumnock	1857
	Wilson, James, Banker, Kilmarnock	1858
	Wilson, James, jun., Newton, Dalkeith	1860
	Wilson, John, of Auchineden, Strathblane	1835
3980	Wilson, John, of Cumledge, Dunse	1841
	Wilson, John, Crosshouse, Roslin	1848
	Wilson, John, Billholm, Langholm	1850
	Wilson, John, Edington Mains, Chirnside	1851
	Wilson, John, Professor of Agriculture, University of Edinburgh	1855
	Wilson, John, Nicolton, Polmont	1855
	Wilson, John, Overhouse, Strathaven	1857
	Wilson, John, of Carlinside, Lanark	1859
	Wilson, John F., House of Muir, Roslin	1859
	Wilson, John, Chapelhill, Cockburnspath	1862
3990	Wilson, John, of Hill Park, Bannockburn	1863
	Wilson, John, of Otterburn, Morebattle	1863
	Wilson, John Pettigrew, of Polquhairn, Cumnock	1863
	Wilson, Peter, Linsaig, Kilfinan, Tigh-na-bruaich	1865
	Wilson, Philip, Corn Factor, Dunse	1857
	Wilson, Richard, C.A., Edinburgh	1858
	Wilson, Robert, Durn, Portsoy	1852
	Wilson, Robert, Firthfield, Anstruther	1852
	Wilson, Robert, Nether Johnstone, Kilbarchan	1863
	Wilson, Robert Sym, of Woodburn, Dalkeith	1841

		Admitted
4000	Wilson, Thomas	1857
	Wilson, Thomas, Haymount, Kelso	1857
	Wilson, William, W.S., Edinburgh	1849
	Wilson, William, Writer, Inverary	1853
	Wilson, William, Gateside, Linlithgow	1853
	Wilson, William, Wester Brathins, Banchory	1857
	Wilson, William, Balquhain, Alford	1858
	Wilsone, George Ross, Endrick Bank, Drymen	1826
	Wink, George, Accountant, Glasgow	1857
	Wishart, Edward, Merchant, Leith	1855
4010	Woddrop, Wm. Allan, of Dalmarnock, Noblehouse	1860
	Wood, James, Midtown, King Edward, Banff	1858
	Wood, James, Whiteside, Greenlaw, Dunse	1864
	Wood, John, Colinsburgh	1835
	Wood, William, Merchant, Leith	1828
	Wood, Wm. E. Colins, of Keithock, Coupar-Angus	1641
	Woodman, William, Stobhill, Morpeth	1856
	Wotherspoon, Archibald, Spotsmains, Kelso	1858
	Wright, Andrew, Corstorphine	1853
	Wright, Bryce, Dowhill, Girvan	1857
4020	Wright, David, Beal, Berwick-on-Tweed	1850
	Wright, James, Glasgow	1839
	Wright, James, Secretary, Royal Bank, Edinburgh	1853
	Wright, William, Woodlands, Girvan	1857
	Wylie, Alexander Henry, Walker Street, Edin.	1863
	Wylie, George, of Arndean, Dollar	1857
	Wyllie, James, Bolfracks, Aberfeldy	1863
	Wyllie, James F., Bolfracks, Aberfeldy	1833
	Wyllie, John, New Farm, Mid-Calder	1849
	Wyllie, Walter, Parkhead, Alloa	1857
4030	Wyllie, W. A., Pensher, Fence Houses, Durham	1855
	Yeats, William, of Arquharney, Advocate, Aberdeen	1838
	Yool, Thomas, Coulartbank, Elgin	1864
	Yorstoun, Captain M. C., of Tinwald, Dumfries	1864
	Young, Alexander, Keir Mains, Dunblane	1852
	Young, Andrew, Lochtyside, Thornton	1859
	Young, George, Solicitor-General	1854
	Young, Harry, of Cleish Castle, Kinross	1842
	Young, James, Land-Surveyor, Perth	1841
	Young, James, Broadholm, Duntocher	1856
4040	Young, James A., Orchardtown, Garliestown	1860
	Young, James, Limefield House, West Calder	1863

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		Admitted
	Young, John, Niddry, Winchburgh	1852
	Young, John, Houston Mains, Houston	1857
	Young, John, Urioch, Balmaghie; Castle-Douglas	1857
	Young, John, Mungall Cottage, Falkirk	1864
	Young, Matthew, Oilcake Manufacturer, Berwick	1863
	Young, William S.	1821
	Young, William D., Edinburgh	1859
	Younger, James, Brewer, Alloa	1864
4050	Younger, Robert, Edinburgh	1863
	Younger, William, Edinburgh	1863
	Yuille, Andrew Buchanan, of Darleith, Cardross	1838
	Yule, Colonel Patrick. Royal Engineers	1827
	Yule, Thomas B., Merchant, Leith.	1852
4055	ZETLAND, The Right Hon. Thomas, Earl of, K.T.	1840